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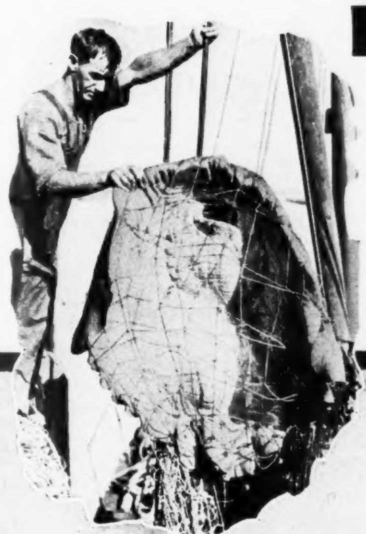
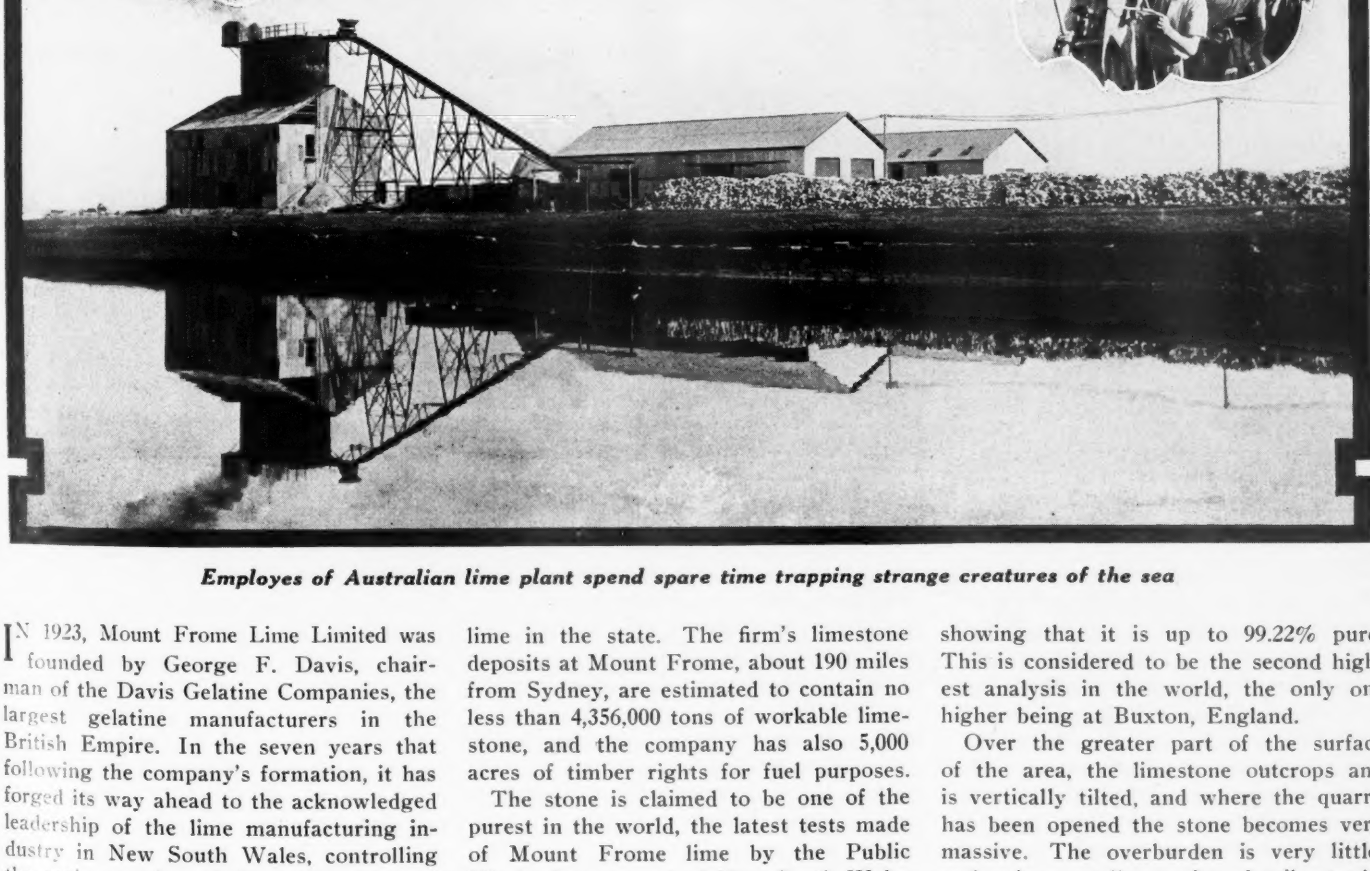
Australian Lime Manufacturer Found Inspiration in America



Written and Illustrated
By ALAN S. EVANS

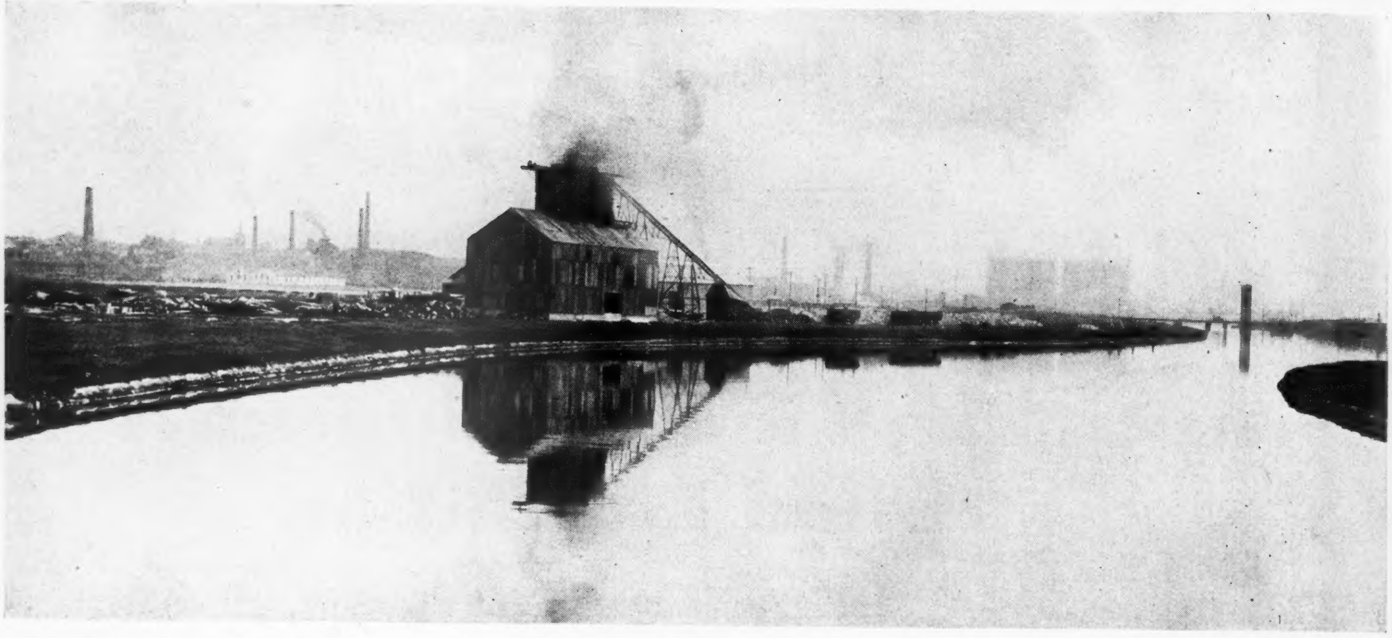


Employes of Australian lime plant spend spare time trapping strange creatures of the sea

IN 1923, Mount Frome Lime Limited was founded by George F. Davis, chairman of the Davis Gelatine Companies, the largest gelatine manufacturers in the British Empire. In the seven years that following the company's formation, it has forged its way ahead to the acknowledged leadership of the lime manufacturing industry in New South Wales, controlling the major portion of the total output of lime in the state. The firm's limestone deposits at Mount Frome, about 190 miles from Sydney, are estimated to contain no less than 4,356,000 tons of workable limestone, and the company has also 5,000 acres of timber rights for fuel purposes.

The stone is claimed to be one of the purest in the world, the latest tests made of Mount Frome lime by the Public Works Department of New South Wales showing that it is up to 99.22% pure. This is considered to be the second highest analysis in the world, the only one higher being at Buxton, England.

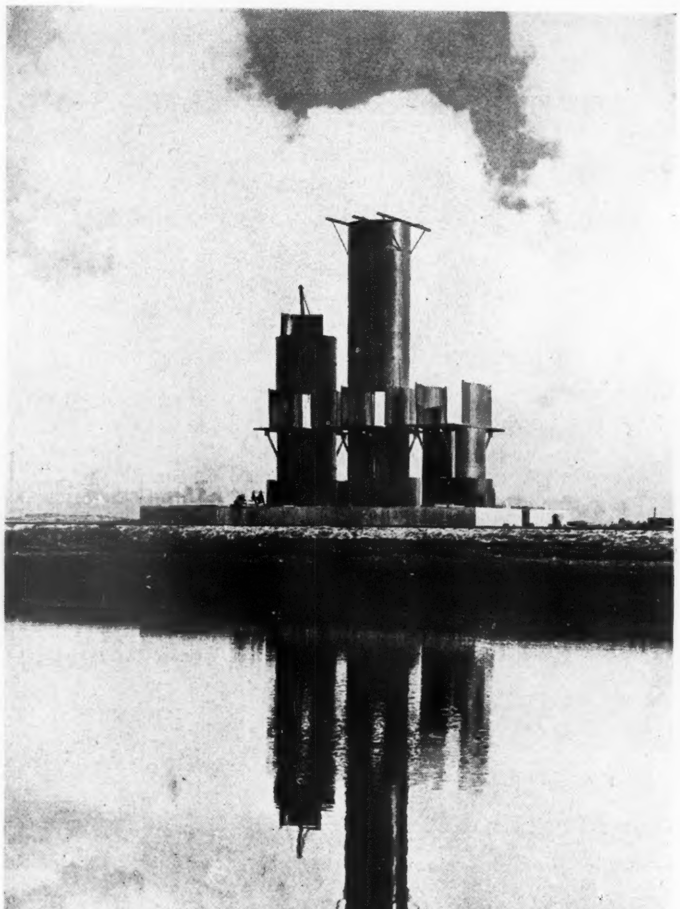
Over the greater part of the surface of the area, the limestone outcrops and is vertically tilted, and where the quarry has been opened the stone becomes very massive. The overburden is very little, and only a small quantity of soil may be



The Mount Frome Lime Works are in the center of a rapidly expanding industrial area and the installation is the first of its kind in Australia

found in the crevices created between the vertically tilted strata. On the quarry site a battery of 12 "D" type kilns was erected, and railway facilities were installed, linking up with the Government network of railways, giving access by rail to all parts of New South Wales. However, with the business of the company rapidly expanding, it was found that the old fashioned plant in use would have to be replaced with the most modern available. Consequently, G. F. Davis visited the United States during a world tour, and spent several months inspecting various plants and interviewing machinery manufacturers, and made an exhaustive study of the latest and best methods in use at the largest lime and cement manufacturing plants throughout the country.

Mr. Davis was most favorably impressed with the progressive methods adopted by most of the American producers, and has nothing but praise for the courtesy shown him and the service given him by the many executives he interviewed during his visit. He was particularly interested in the excellent spirit of co-operation existing among the various members of the industry. The help given Mr. Davis in America has been of wonderful assistance to the company, and also, Rock Products has played no small part in the company's progress, for it has kept us in touch with the latest developments and most modern methods employed in the industry. Great assistance has been given us, also, by the technical data and trade bulletins sent us by the National Bureau of Standards, Washington, and the National Lime Association of America.



First three of twelve kilns of York type to be erected following investigation of American practice

After the type of plant was finally decided upon, an initial order was placed for three steel kilns and one complete hydrating unit, and these were shipped to Sydney. During their erection they commanded a considerable amount of attention in the industry of New South Wales, no others of their kind having been imported into this country. In place of burning at the quarries for the Sydney market, it was found more advantageous to rail the stone to Sydney and burn it there, delivering to clients daily in bags, fresh from the kilns. For this purpose, the company has acquired a fleet of fast motor trucks and deliveries are made at such times and in such quantities as buyers desire.

The site of the new plant is ideal from a lime manufacturer's point of view, and was decided upon only after many varied positions were inspected, and their advantages and disadvantages were weighed. The kilns are situated on the banks

Hydrated lime was furnished for the Sydney Harbor bridge, Sydney, New South Wales

of the Alexandria Canal, giving access via Cooks River to Botany Bay and the Pacific.

The N. S. W. Government Railway runs through the company's property, giving the advantage of direct transportation facilities to all parts of the Commonwealth of Australia. In addition, handling charges of raw materials and the finished product were reduced to a minimum. The steel kilns have enabled the company to cut production costs to a remarkable degree; fuel by approximately one-third and wage costs by 65%, against similar charges for an equivalent production under other existing lime burning practices in Australia.

The aggregate cost per ton of finished burnt lime packed ready for delivering is reasonably within the average store price of similar industries operating in the United States of America according to current market price-lists.

Pioneer in Development of Hydrated Lime

Mount Frome Lime Limited has done more than any other organization in Australia in introducing hydrated lime into New South Wales. Prior to the marketing of this commodity by the company, hydrate was practically an unknown quantity, but now the company has opened up new avenues of trade, and supplies many of our key industries, including sugar refining, tanning, glass manufacturing, ammonia manufacturing, glue and gelatine and a vast number of industrial undertakings where the process of bleaching, purification, absorption of gases, neutralization, dehydration, precipitation and utilization of by-products is needed and applied. Mainly through the company's efforts the adoption of hydrated lime is making very rapid strides in Australia for building, constructional, industrial, chemical and agricultural purposes, whilst its yet undeveloped uses represent an enormous and definite field for the absorption of the output of the plant.

Tests of the company's products carried out by the Department of Public Works of New South Wales in accordance with the specification as set out in the Australian Commonwealth Engineering Standard's specification for quicklime and hydrated lime show the following results which should be of interest to American executives for comparison with local standards.

HYRADATED LIME	STANDARDS	RESULT OF TESTS
Calcium and magnesium oxides	Min. —95.0%	98.70%
Carbon dioxide	Max. — 7.0%	1.58%
FINENESS		
Residue on 30x30 standard sieve	Max. — 0.5%	0.05%
Residue on 180x180 standard sieve	Max. —12.0%	1.56%
SOUNDNESS: SATISFACTORY		

Note: There being no Emley plasticimeter available, the test for plasticity could not be carried out. However, large samples of our hydrate have been shipped to U. S. A. for testing purposes and delivered to several experts. All were highly complimentary in their reports. These reports indicated that our hydrate gave a unit of plasticity equal to the best American dolomitic hydrates and far exceeding any high calcium hydrate previously tested.

QUICKLIME	STANDARDS	RESULT OF TESTS
Calcium and magnesium oxides	Min. —92.0%	99.22%
Oxides of silicon, aluminum and iron	Max. — 8.0%	0.69%
Carbon dioxide	Max. —10.0%	0.42%
WASTE		
Residue on 20x20 standard sieve dried to constant weight at a temperature of 212-221 deg. F.	Max. —10.0%	3.55%

Placing Industry on a Par with Other Countries

Although the lime industry in Australia was daily increasing in importance, at the time when the Mount Frome company entered the field, it was a regrettable fact that the methods of production had not advanced to the extent that the importance of the industry merited. Production costs were inordinately high in comparison with the modern methods employed in the United States and Europe.

The company's chief executive on his return from investigation of the industry in America, was so greatly impressed with the potentialities of the Australian market for all limestone products, and more particularly hydrated lime, that he at once embarked upon his policy of modern production methods that has done so much to rouse the industry here from its lethargy.

Report of A. S. T. M. Committee C-9 on Concrete and Concrete Aggregates

Now Working on About 100 Projects

THE COMMITTEE has under consideration approximately 100 independent projects in the field of concrete and concrete aggregates. This work is divided among 60 members, grouped into 15 technical and three administrative subcommittees. Active consideration is being given to each of the projects. Progress reports on many of them may be found in the report before the annual meeting of the society. The following summarizes briefly items of the more important work to which special attention is being given this year and will serve to give some indication of the scope of the committee's activities.

The subcommittee on unification of specifications has prepared a "Proposed Tentative General Specification for Concrete." This specification is intended to include only the frame work necessary to write the specifications for materials and methods which have been, or will be, prepared by Committee C-9. The work of this subcommittee is of special value in pointing out phases of problems connected with concrete and concrete aggregates on which more definite information is required.

Design of Concrete

The subcommittee on design of concrete has paid particular attention to the development of a method for design of concrete based on flexural strength. Information has been collected on the effects on flexural strength of such factors as moisture content of specimens at time of test, richness of mix, age of concrete and surface of aggregate. The subcommittee also has before it the problems of designing concrete by mortar-voids, methods for securing high-early-strength concrete and the preparation of a specification for proportioning.

Strength tests of concrete involve many problems which have not been solved, and the subcommittee having this work in charge has much work before it. It has recently proposed a method for loading concrete beams. At the last meeting of the committee it presented a method of making the flow test for workability of concrete. Active work is being done on methods for measuring cores drilled from concrete structures, storage temperatures of curing rooms and several other projects.

The subcommittee on permeability tests of concrete is comparatively new and is just now getting its work well under way. It has prepared a bibliography of the literature and has under way a resumé of the data covered by it. A preliminary report of some results with a "Bomb-type" apparatus has been made by one of the members of the subcommittee.

Specifications and methods of tests of aggregates has, as in the past, received a large share of the committee's attention. One of the most important phases of the problem lies in the development of information on factors contributing to lack of durability of concrete. The subcommittee has submitted suggested methods of test for soundness of aggregate by the sodium sulphate method and by freezing and thawing. It has made certain revisions in aggregate specifications noted in the current Proceedings of the Society and, at the last meeting, suggested the inclusion of a uniformity factor, based on the fineness modulus, in the specifications for fine aggregate. The work of this subcommittee covers a large number of projects, too numerous to discuss here; many of them were covered in considerable detail in the report before the last annual meeting of the society.

The subcommittee on extraneous substances in concrete is paying particular attention to the development of information on the effects of substances contributing to lack of durability of concrete. Of the several projects under consideration most complete information has been collected thus far on effect of coal and lignite, flat and elongated particles and oil bearing aggregates.

Apparatus for testing concrete and concrete materials is in a much less standardized condition than might be supposed. The subcommittee having this problem in charge has prepared a digest of all apparatus sponsored by the committee. This has been done as a necessary step in unifying descriptions and specifications of apparatus. Progress reports have also been made by the subcommittee for consideration of the committee as a whole on storage room and moist cabinets for curing cement and concrete and on core drilling equipment. The apparatus for making flexural tests of concrete proposed last year is still receiving study.

Materials and Mixing

Measurement of material, mixing and placing concrete is assigned to one subcommittee. Particular attention has been paid to the development of methods for determining the constituents of fresh concrete. Methods which have been proposed by various investigators have been studied and reviewed and a report describing the various methods has been prepared. Work has also been done in the development of a method for analyzing hardened concrete. The preparation of a specification for mixing and placing concrete is an important project before the subcommittee.

The subcommittee on curing of concrete has before it the problem of the preparation of specifications for curing for all types of concrete work. No specifications have been prepared as yet, but the subcommittee is keeping in close touch with several comprehensive researches which are being carried out along these lines and, particularly, with the work of the committee on curing of the Highway Research Board, which is conducting a survey of field and laboratory projects.

Measuring Workability

The work of the subcommittee on workability of concrete up to the present time has consisted mainly of attempts to measure the workability of concrete by different devices, which, regardless of the success attained, are too cumbersome for every day use in the field, or even in the laboratory. The devices, or some of them at least, are designed to measure the fundamental flow-force relations in a cement mixture, in a manner analagous to the methods used in studies of plastic materials. The importance of continuing these fundamental studies cannot be over-emphasized. They have proceeded far enough to indicate rather clearly the fact that a concrete mixture possesses essentially the same characteristics as a cement paste, masked and modified, however, by the large burden of aggregate which has to be "carried" by the paste.

The subcommittee on elasticity and volume changes has been particularly active during the past year. The status of its work and reports on several of its projects are included in the report before the last annual meeting of the society.

Conditions Affecting Durability

The subcommittee on conditions affecting durability of concrete has devoted a large share of its attention to inspections and studies of existing structures which have attained considerable age. It has cooperated in the arrangement of a symposium on methods of determining the durability and weathering characteristics of concrete materials, brick and natural stone to be presented before the next annual meeting of the society. The subcommittee has prepared and submitted to Committee C-9 a "Suggested Terminology Descriptive of Conditions of Concrete in Service."

At the last meeting of Committee C-9 the problems connected with the production and transportation of ready-mixed concrete were given considerable attention. As a result a new subcommittee, under the chairmanship of R. B. Young, has been formed to study these problems.

Committee C-9 is giving careful consideration to means of preventing overlapping and duplicating efforts of various organizations interested in concrete and concrete aggregates. Steps are being taken in an endeavor to arrange for a better correlation of the activities of the several committees interested in the same field.

Method and Cost of Dredging Sand and Gravel by the Ohio River Sand Co., Louisville, Ky.*

By J. Hamilton Duffy

One of the Consulting Engineers, U. S. Bureau of Mines, and Vice-President, Ohio River Sand Co.

THIS is the first of a series of papers describing dredging methods and costs in recovering sand and gravel from the beds of rivers throughout the United States and deals directly with the methods employed and costs obtained by the Ohio River Sand Co. near Louisville, Ky.

The author wishes to acknowledge the assistance of J. R. Thoenen, mining engineer of the Bureau of Mines, in the collection of data and compilation of this report.

History

The Ohio River Sand Co. operates two ladder-type dredges in recovering sand and gravel from the bed of the Ohio river in the vicinity of Louisville, Ky.

An industry which may be considered as the forerunner of the river sand and gravel business in this vicinity was the collection of paving boulders from the shallow parts of the river prior to 1875. These boulders were gathered by men wading the river and scooping them up by means of forks. The boulders were loaded into skiffs and poled or rowed to shore, where they were transferred to wagons for delivery in Louisville for paving.

In 1875, J. T. Duffy installed a derrick boat equipped with a clamshell bucket. This was essentially a wooden hull on which was mounted a derrick with its steam boiler and hoist. By means of the clamshell bucket, operated by the derrick, sand and gravel were dug from the river bottom and dropped into a hopper on the derrick boat. This hopper fed directly to a short trommel with a ¼ to ½ in. mesh screen. The sand passed through the screen and was spouted to a wooden barge moored alongside. The coarse material or gravel was discharged back into the river as a waste product.

The sand was then towed to Louisville by steam tow boats, where it was unloaded by hand into wagons for delivery to the glass furnaces.

About this time the practice of sawing stone for building purposes was introduced, creating an increased market for sharp hard sand. Later on the market demands varied to include such products as mason's sand, roofing gravel and finally sand and gravel for concrete.

As the market for river products increased Mr. Duffy, with Paul C. Barth and James Settle, organized the Ohio River Sand Co. This company in its early years had nothing to do with the production end of the business, but confined its activities to selling and distributing the material supplied by Mr. Duffy. In 1906, however, the company took over the whole operation and has continued to the present time.

In 1904 the old derrick boat and clamshell were replaced by a dredge equipped with a centrifugal pump.

This equipment was in turn replaced in 1924 with a modern ladder-type dredge to which a second unit or dredge was added in 1928. Both of these dredges are now in operation and both are described in detail in this report.

The first production of commercial gravel dates from 1904. With the derrick boat and barges unloaded by hand, the company produced an average of 100 cu. yd. daily, which was sold at a price of 90 c. per yd., delivered anywhere in the city of Louisville.

As business increased a stiff-leg derrick was erected on the river bank, replacing the hand labor in unloading the barges. The derrick picked the sand and gravel up from the barges and dropped it into a hopper on the bank, from which it passed by gravity to wagons. With this equipment the plant capacity was increased to 450 cu. yd. daily.

In 1907 the stiff-leg derrick on the river bank was replaced with a clamshell dredge. This unloaded the material into a hopper on a barge moored to the river bank. A flexible bridge and track connected this barge with an incline on shore. Wooden and steel cars now replaced the wagons and the gravel was hoisted up the incline and over a trestle to be dumped to storage piles on shore. Production was thus increased to 1000 cu. yd. daily.

In 1923 the present land method of handling material was installed. Briefly, it consists of a Brownhoist bridge crane and system of elevated conveyor belts delivering to truck hoppers, railway cars or storage piles. The unloading crane is equipped with a 3-yd. clamshell bucket and there are 1500 ft. of conveyors. The railway sidings have a capacity of 35 cars. There is room for storing 150,000 tons of material behind concrete retaining walls and the loading hoppers have an additional capacity of 5000 tons.

In 1915 all wagon hauling for city delivery was replaced by auto trucks and in 1926 all wooden river equipment was replaced by steel.

The present capacity of the plant is 350 tons per hour.

Geology

The gravel deposits present the familiar characteristics of river-bar geology. Both sand and gravel have been carried down the river for centuries. Flood stages in spring and fall have brought in vast quantities of fresh material to be sorted and deposited according to the vagaries of the changing currents. Thus heavy coarse gravel is found at points of rapid current and fine sand and mud where the velocity of the current diminishes. Constant changes occurring in the direction and velocity of the currents cause the previously formed bars to be reworked and as a consequence coarse and fine gravel are found intimately mixed with large volumes of fine sand.

Bars Now Inundated

Formerly many of these bars were above low-water level and could be prospected and tested by dry-land methods. With the recent completion of the federal system of dams a minimum water level is maintained which inundates practically all the river bars.

At points where the current has a comparatively low velocity the gravel is found covered with from 6 to 8 or more feet of fine sand and mud. In swifter currents coarse gravel with little fine material forms the river bed.

At many points boulders ranging in weight from 10 to 300 lb. are found scattered over the river bed and imbedded in the gravel.

Many of the gravel bars are rendered commercially useless or at best are workable with difficulty because of water-logged debris, consisting of tree trunks, branches and stumps carried down during floods.

During recent years an increasing amount of fine coal has been found in the deposits. It is thought this originates from sunken coal barges which have been lost in the river from time to time.

The commercial gravel deposits as found in place vary greatly both in depth and area. In a distance of 100 ft. laterally a good coarse gravel deposit may change to fine sand.

In addition to the underwater deposits operated by the company, it owns two islands in the river. These islands have been tested by churn drilling and the gravel beds contained in them have been shown to vary considerably. The gravel itself varies from 20 to 50 ft. in vertical thickness and is overlaid with from 5 to 20 ft. of sand. This in turn is covered with 5 to 20 ft. of silt or river mud. The larger of these islands comprises 225 acres and is estimated to contain over 16,000,000 tons of sand and gravel.

Within the gravel beds on the islands is a stratum of heavy blue clay from 12 to 18 in. thick. This clay stratum causes trouble

*Reprinted from U. S. Bureau of Mines Information Circular 6421.

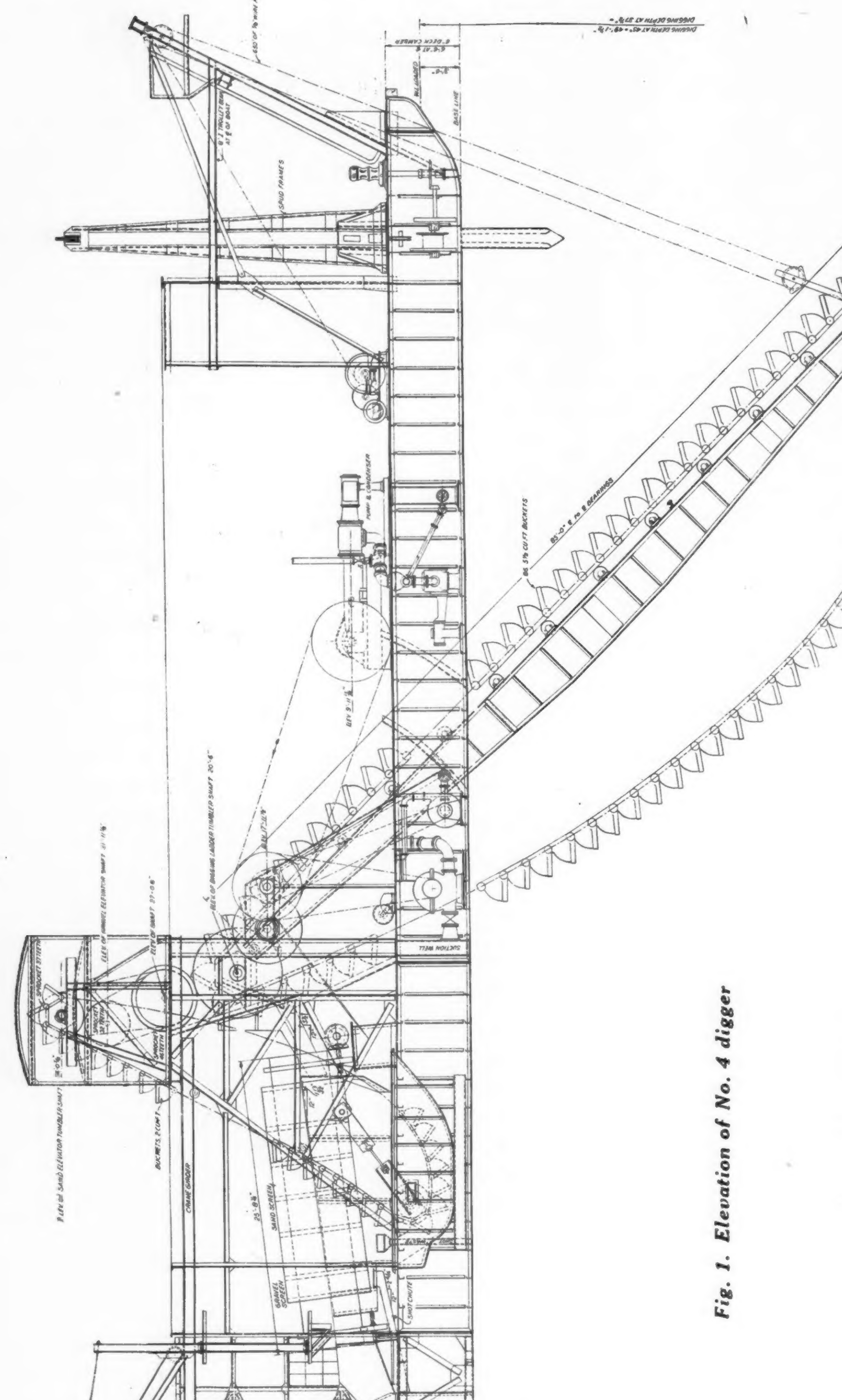


Fig. 1. Elevation of No. 4 digger

in that when dug up with the gravel it does not disintegrate but forms clay balls which are difficult to separate from the gravel.

In the early land grants the bottom of the Ohio river belonged to the owner of the Kentucky shore. This limit was defined as continuing under the river to the low-water mark on the Indiana shore. In most cases surveys have defined just where this low-water mark ends. The system of federal dams in the river has in many instances permanently raised the established low-water mark on the Indiana shore by inundating considerable area. This inundation, however, has not changed the ownership of the flooded area. All this area between the low-water mark as established by surveys and the present shore line belongs to the Indiana owner. Therefore, Indiana land owners have been able to exploit these flooded gravel deposits by dredging since the completion of the dams.

Conditions Affecting Dredging Operations

At present the recovery of gravel is complicated by the condition of the river bottom as left by former dredging operations. The formerly used clamshell and pump dredges excavated shallower holes than the present type of ladder dredge. Pump suctions, as they dug, cut inverted conical openings in the bottom with tops widening as the pump went deeper. This caused caving and as the sides caved an increasing number of boulders collected at the suction intake. This accumulation finally blocked the suction and the dredge was forced to move. This meant the gravel was recovered from a series of holes which in most cases did not extend to the bottom of the gravel. Considerable of the present dredging is over this uneven bottom from which the commercial material has been only partially removed and in which boulders are found in troublesome accumulations. These holes have also been more or less filled by river mud and other debris, depending on the length of time since they were dug.

Where undisturbed the upper 8 to 10 ft. of a gravel bed will usually be found to contain 50% sand and 50% gravel, while that below will be more apt to run 75% sand and 25% gravel.

The ladder type of dredge was adopted because it afforded a means of recovering a maximum of gravel with a single passage over the bar. It will also operate with less delay in bottoms that have been worked over by other types of dredges and the accumulated boulders found therein offer little difficulty to the ladder buckets. A further reason for the choice of the ladder type over the centrifugal pump dredge is its more

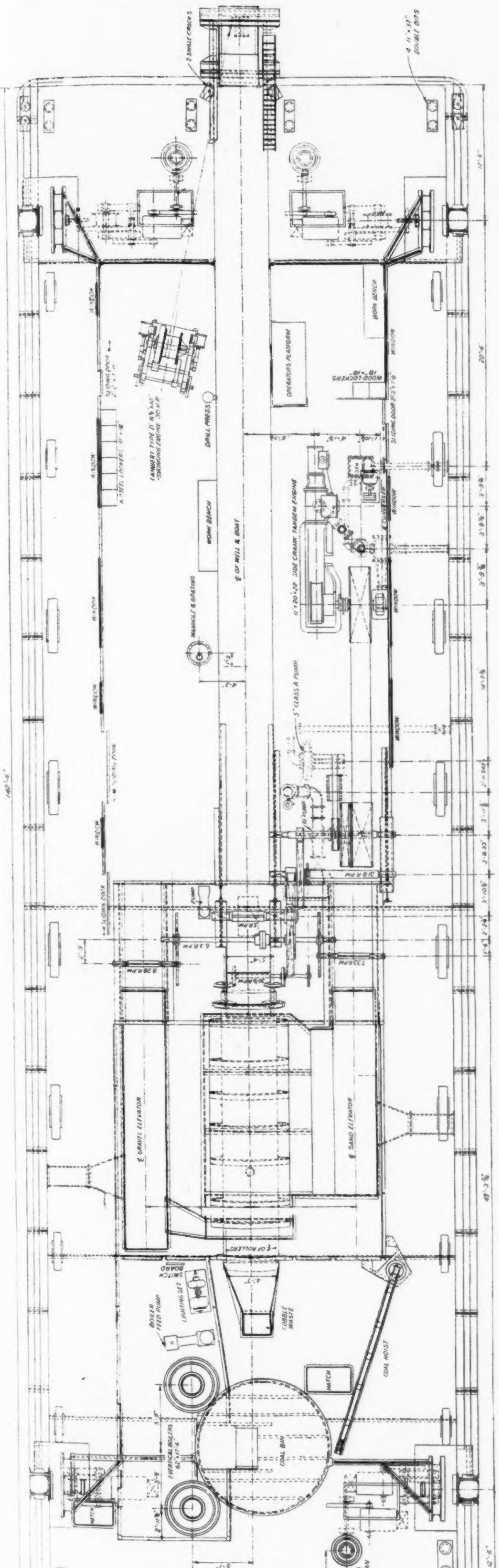


Fig. 2. Plan of No. 4 digger

economical use of power. The centrifugal pump must handle from 80 to 90% water with only 10 to 20% solids in its delivery. This means the expenditure of a large quantity of power for moving water, which is immediately discharged to the river again. In hard-bedded gravel the gravel must often be broken up ahead of the suction by means of a cutter head. This requires further power. The ladder buckets do not require any prior cutting of the bank and deliver the gravel with a minimum of water, thus allowing the power to be expended directly for the recovery of gravel without excessive waste.

This type of dredge is necessarily of larger size and requires much larger capital investment. On the other hand, the capital investment per ton of productive capacity is probably on a par with other types of dredges, while the power expenditure and labor cost per ton of material recovered are less.

No accurate data are available regarding the ratio of recovered sand and gravel to the tonnage dug. The reason for this is the variation in the material in the bars. At one place the gravel (3/8 to 2 in.) will compose 30% of the material dug, with roughly 1% oversize and the balance sand. At another point the ratio may be 60% gravel and 40% sand and at still another point one may find 25% gravel and 75% sand.

Prospecting

Because of the erratic and constantly changing characteristics of the gravel beds, prospecting in advance of actual digging is of little use. A locality prospected one year and found to contain a bed of good gravel may the year following be covered with such an accumulation of drift and debris as to make it unworkable, or the gravel may have been removed by changing river currents.

Where deposits can be reached above water level they are prospected by churn drills.

The usual practice in examining the river bottom is to sound with iron bars or pipes. By this method the operator can obtain some idea of the depth of silt or fine sand overlying the gravel or the presence of gravel itself on the river bottom.

Final prospecting, however, is done by setting a dredge over the location and actually digging. The material dug is examined for quality and ratio of sand to gravel. If not of commercial grade, the dredge is moved to another locality.

Methods of Sampling

Sampling of deposits is not practiced except by visual examination of the material as brought up by the dredge buckets.

Marketable material is sampled and sent to customers for test as required.

Choice of Method

Since all the gravel bars lie below water level and are erratic in both area and depth, the only practical method of operation is some form of dredging.

The original installation of clamshell and centrifugal-pump dredges has been superseded by the present ladder dredges for reasons already discussed.

Since gravel seldom extends more than 55 ft. below the water level, the dredges were designed to operate at this maximum depth.

These dredges are designed and constructed to form complete, floating, washing and screening plants, although no provision is made on them for storage of finished material. In addition, they are provided with living quarters for their crews.

In brief, the method of operation is to dig the gravel by a rigid ladder or continuous bucket elevator. This discharges the material as dug into a hopper in which it is mixed with a sufficient quantity of wash water. It then passes to trommels wherein the sand and larger boulders are removed from the gravel. The boulders are discharged through chutes into the river, but the sand and gravel go to separate sumps or tanks. From the sumps the gravel is raised by bucket elevator to discharge over a series of sizing screens of such aperture as the market sizes require. After passing these screens the gravel is discharged through chutes or on conveyor belts to barges moored alongside the dredge.

The sand is picked up from its sump by a second elevator and dis-

charged to barges on the opposite side of the dredge or wasted to the river as market requirements demand.

When the barges are loaded they are towed by river steamers to the storage plant on the river bank at Louisville.

The gravel is partly washed in the digging operation. Washing continues through all the screening operations so that when discharged to the barges all silt and mud have been removed. This silt and mud pass back to the river with the excess wash water.

No further sizing is practiced at the storage plant at Louisville.

Excavating

There are two dredges in operation. The older, designated as *No. 4 Digger,* is a steel-hulled ladder-type dredge designed and built by the Dravo Contracting Co. of Pittsburgh, Penn. An elevation and plan of this dredge are shown in Figs. 1 and 2.

The digging mechanism consists of an endless bucket elevator in which the buckets themselves form the links in the chain. This elevator is mounted on a heavy rigid structural-steel frame hinged at the upper or discharge end and working through the center line of the hull. The lower or digging end is raised and lowered at the will of the dredge operator by means of multiple blocks and cable operating through a steam-driven hoist on the main deck. The operator's station is placed so he has an unobstructed view of the ascending buckets. When digging is interrupted by the buckets encountering heavy debris, such as sunken tree trunks, the operator can raise or lower the ladder by simple manipulation of the control levers.

The buckets discharge into a steel hopper supported by the steel superstructure, and the gravel is fed by gravity to a trommel having 2¼-in. round openings. Surrounding the trommel is a jacket screen with ⅛-in. openings. To prevent blinding this jacket, steel rollers are arranged to ride the outside as the screen revolves.

Oversize material which will not pass the 2¼-in. openings is discharged into the river as waste. There is not sufficient of this material found to warrant the installation of a crusher to reduce it to commercial size.

The sand and gravel passing the 2¼-in. openings but retained on the ⅛-in. screen are chuted to the boot of a continuous bucket elevator similar in construction but smaller in size than the ladder. This elevator discharges over two double-deck vibrating screens. The mesh of these screens is varied from time to time to produce the desired market sizes.

Material passing ⅜-in. round openings is designated as sand and is delivered from the vibrating screens through conveyors or chutes to the river as waste or to a barge moored alongside the digger, depending on the demand for coarse sand.

Material passing the ⅛-in. jacket screen drops to a second continuous bucket elevator which discharges to a chute over the side of the digger. This discharge is also either chuted to waste in the river or to a barge as fine sand. The arrangement is such that this fine sand is discharged on one side of the digger while the coarse sand and gravel are discharged on the opposite side.

Both secondary elevators dig their material from steel tanks in which the sand or gravel is deposited from the trommel. The constant agitation of the water and sand or gravel in these tanks by the moving elevator buckets keeps the fine mud and silt in suspension, and they pass off in an overflow from the tank. The elevators thus carry comparatively clean sand or gravel to the vibrating screens or barges.

However, further rinsing is provided by additional wash water playing on the screens as the material is sized.

Ordinarily a coarse and a fine gravel are made as well as two sizes of sand.

By a system of conveyors the two sizes of gravel can be loaded into the same barge or into separate barges at the will of the operator.

The *No. 4 Digger* is steam driven and in average digging has a capacity of 500 tons per hour. Production at this rate requires the handling of 8000 gal. of wash water per minute or roughly 1000 gal. per ton of material handled.

The second dredge, known as the *Kentucky,* is also a steel-hulled ladder-type dredge designed and built by the Dravo Contracting Co. Since this dredge represents more modern construction it will be described in more detail, and is illustrated in Figs. 3 and 4.

The hull is of 5/16-in. mild open-hearth steel plate, 155 ft. long by 44 ft. wide and 8 ft. deep, fitted with suitable transverse and longitudinal frames and bulkheads.

The digging ladder is built of plate and angle sections. It is 88 ft. in length and provides a digging depth of 55 ft. below the water line. A 10-part line running over sheaves in the bail and bow gantry provides means for raising and lowering the ladder. The ladder is fitted with 86 cast-steel buckets of 4⅓ cu. ft. capacity each. These are fitted with heat-treated steel pins and manganese-steel bushings. The buckets travel at a speed of 33 buckets per minute, corresponding to a digging capacity of 400 tons per hour.

The ladder buckets deliver their load of material to a hopper built of ⅜ and ½ in. steel plate fitted with cast-steel harp (grizzly) bars to prevent the entry of oversize material. These are spaced at 6-in. intervals and set at such an angle that boulders will move by gravity to the lower end and fall into the waste well. Cleaning bars operated by small steel cylinders are also provided to assist the oversize material on its way to the waste well. These cleaning bars are under the control of the dredge operator.

The material discharges by gravity to a steel washing tank from which it is elevated by a bucket elevator having 4 cu. ft. buckets and discharged to a 24-ft. rotary scrubber 6 ft. in diameter fitted with a 13-ft. jacket 9 ft. in diameter.

The first 7 ft. of the scrubber has 1¼-in. round perforations.

The next 6-ft. section is a solid plate fitted with lifting angles for the purpose of lifting the gravel and letting it fall and thereby providing more thorough washing.

The third section, 7 ft. long, has a screen with 2¼-in. perforations.

The outer screen or jacket has ⅝-in. round openings. Wash water at high pressure is applied on all sections of the scrubber.

All material passing through the screens of the trommel passes over a flat steel pan where it is again subjected to the cleansing effect of high-pressure wash water. From this pan the sand and gravel passes to a second steel washing tank fitted with a suitable overflow for excess wash water and suspended mud and silt. This overflow discharges to the river.

Oversize material from the trommel is discharged into the river.

After the Washing Operation

The washed sand and gravel in the washing tank is elevated by a bucket elevator having buckets of 4 cu. ft. capacity each. The bottom spool can be raised or lowered at will. These buckets are of similar design and material as the digging ladder buckets except as to size.

This elevator delivers the material to a 3-way distributing hopper feeding 9 Tyler Hum-mer screens operating in parallel sets. The upper 6 screens are ⅜ by ¾ in. wire mesh and the lower three ⅝- by ⅝-in.

The product passing through the first six screens moves to three Tyler Hum-mer screens fitted with 3/16 by ½-in. wire mesh. The oversize and undersize from this set of screens are dropped to bucket elevators and elevated to chutes discharging to barge or river as desired. That material passing over the ⅝-in. Hum-mer screens drops to a 4 by 8 ft. Simplicity mechanically-vibrated screen, where it is drenched with final wash water before its discharge to the gravel barge.

The main conveyor drain plates are lined with 5/16-in. rubber vulcanized to ⅛-in. steel plate.

Gathering pans for sand and all sand hoppers and chutes are lined with ⅜-in. rubber vulcanized to ⅛-in. steel plate.

The two sand elevators are designed for a capacity of from 30 to 60% of the digging capacity. The capacity is regulated by changing the speed of the elevator.

The main ladder engine is a 150-hp., 16 by 16 in. Uniflow condensing engine operating at 200 r.p.m. This engine transmits power through a 6-ply balata belt to the transmission shaft. The digging ladder is operated by two sets of gears from the transmission shaft. This engine drives the

ladder, rotary scrubber, and two main elevators.

The rotary scrubber is operated from the main ladder drive through sprockets and chain and two pairs of bevel gears. The main conveyors are operated through sprocket and shaft and sets of spur gears.

The engine driving the high and low pressure centrifugal pumps and the generator is similar to the main ladder engine, but running at 230 r.p.m.

The two sand elevators are driven by individual electric motors through speed reducers.

Wash water is provided by a 12-in. centrifugal pump operating at 900 r.p.m. against a head of 100 ft. and delivering 2400 gal. per min.; a 10-in. centrifugal pump operating at 900 r.p.m. against a head of 40 ft. and delivering 1600 gal. per min.; and a 6-in. centrifugal pump operating at 400 r.p.m.

The first two pumps are belt driven from the auxiliary engine. The 6-in. pump is direct connected to a single-cylinder vertical Engberg steam engine with 4-in. bore and 4-in. stroke.

Steam is furnished by two vertical firetube boilers of 150-hp. capacity each. They are 6 by 21 ft. in size and fitted with 188 2½-in. tubes 14 ft. long. The boilers are designed for 170 lb. steam pressure and are provided with baffles in the upper part of the steam drum to obtain a high superheat.

The ladder hoist is a single-drum, double-reduction, reversible steam engine.

Two double-cylinder, double-gear reduction steam engines are provided for raising the stern spuds.

There are two warping engines, one on each side of the boat. They are four-drum, double-reduction, two-cylinder steam engines. These engines also drive separate drums through another set of gears for hoisting the bow spuds.

The spuds are 36 by 36 in. by 66 ft. in size, built of ½-in. steel plate and 8 by 8 by ½-in. angles.

The electrical equipment consists of a Westinghouse 50-kw., 250-volt, 200-amp. generator operating at 1150 r.p.m. and a 3½-kw., 16-amp., 220-volt generator direct connected to a single-cylinder Engberg steam engine with 4½-in. bore and 4-in. stroke operating at 505 r.p.m.

The usual complement of auxiliary machinery and equipment suitable to this type of dredge is provided, including a well-equipped but small machine shop.

Large well-equipped quarters are provided for the crew and a complete commissary and

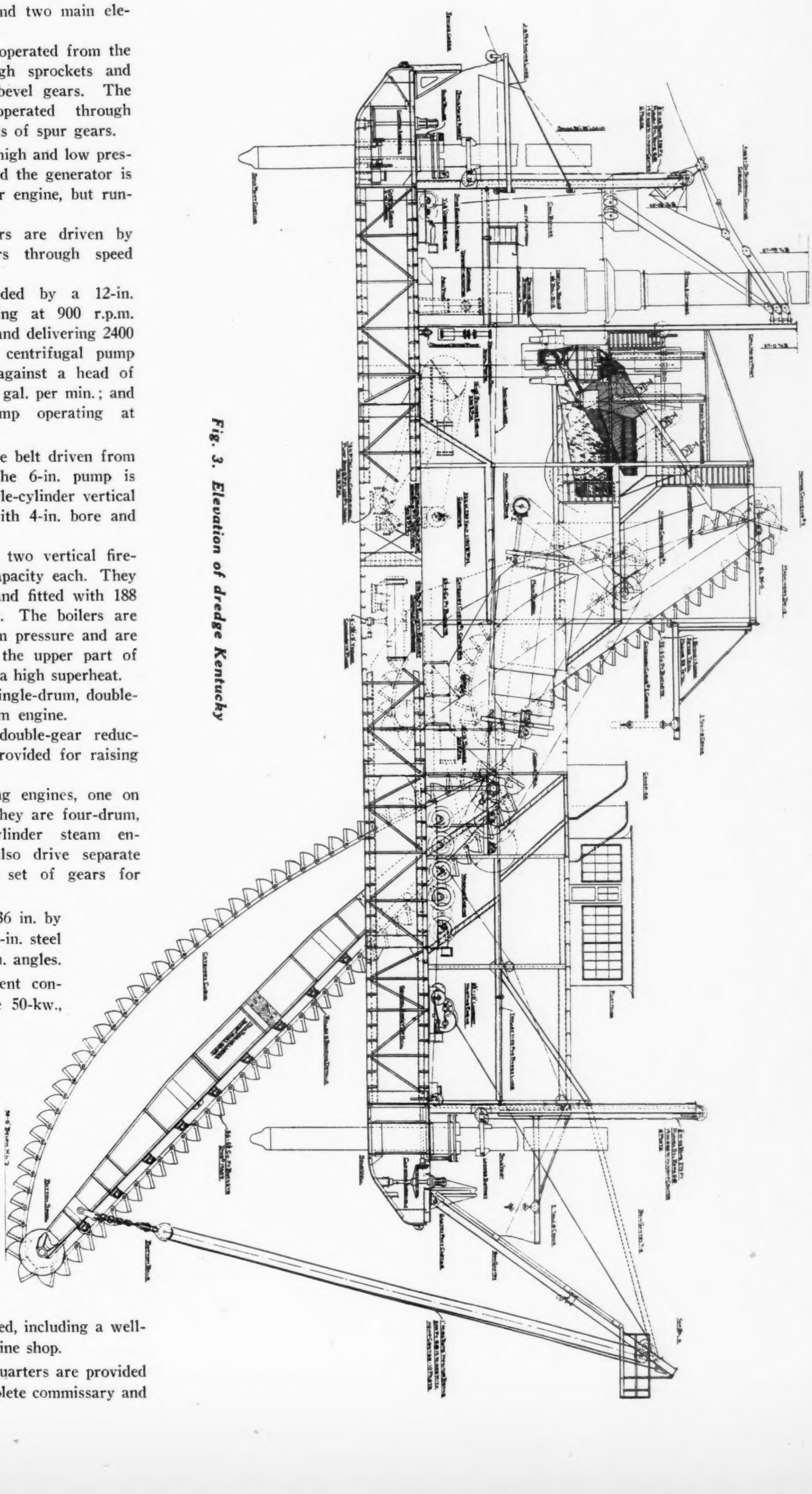


Fig. 3. Elevation of dredge Kentucky

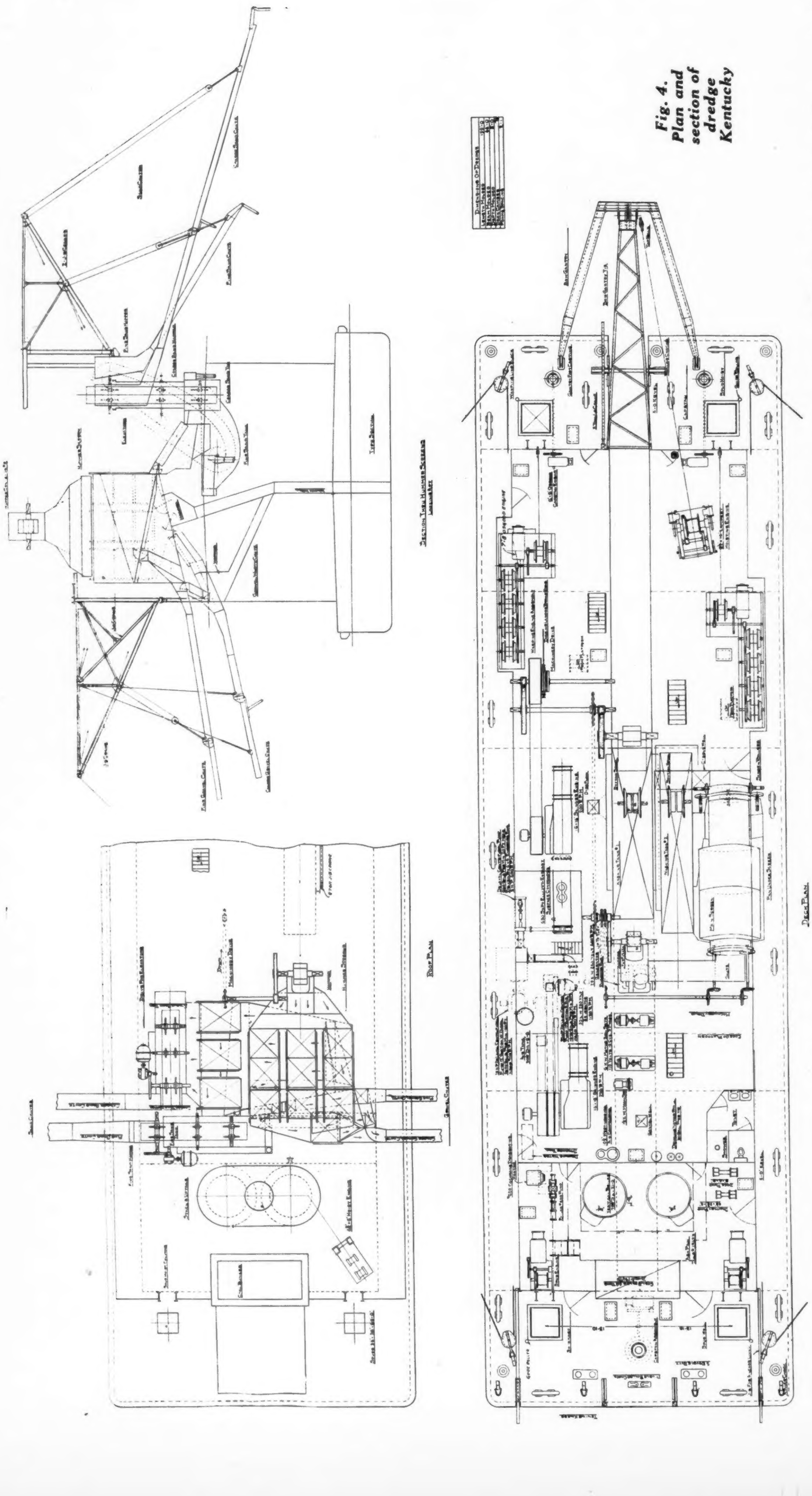


Fig. 4. Plan and section of dredge Kentucky

dining room is also a part of the accommodations.

Transportation

Both *No. 4 Digger* and the dredge *Kentucky* are served by the steamer *Duffy* and 20 steel barges of 650 tons capacity each (Fig. 5).

The *Duffy* is a flat-bottomed, steel-hulled, sternwheel river tow boat, 26 by 135 ft. overall with a depth from deck to bottom plates of 5 ft. and a draft of 3½ to 4 ft.

She is powered by three fire-tube marine boilers 38 in. in diameter by 26 ft. long, each having six 6-in. tubes. These boilers provide steam at 240 lb. pressure to operate the driving engines and all auxiliary pumps and machinery.

The driving mechanism consists of two noncondensing Hegewald steam engines with 15-in. cylinders and 4½-ft. stroke. The pistons are direct-connected to the cranks operating the stern paddle wheel, one engine on each side.

The usual complement of boiler-feed pumps, steam winches, and capstans is present and in addition the steamer carries three light plants. One is a Pyle National, 13-amp., 120-volt generator direct connected to a small steam turbine and is used for emergency or for such lighting as is needed during daylight.

A Delco lighting plant is provided to operate a refrigerating plant.

A Troy, single-cylinder, 8-hp., steam engine belted to a Willey Electric 8¼-kw., 120-volt, 66-amp., generator provides current for powerful searchlights and general lighting for night operation.

The steamer is provided with Gardner steam-driven steering gear.

The *Duffy* can pull 10 loaded barges down stream at a speed of about 3 miles per hour. Running light, she has a speed of about 8 miles per hour.

A full double-shift crew consists of 13 men but only 6 men are required for daylight running.

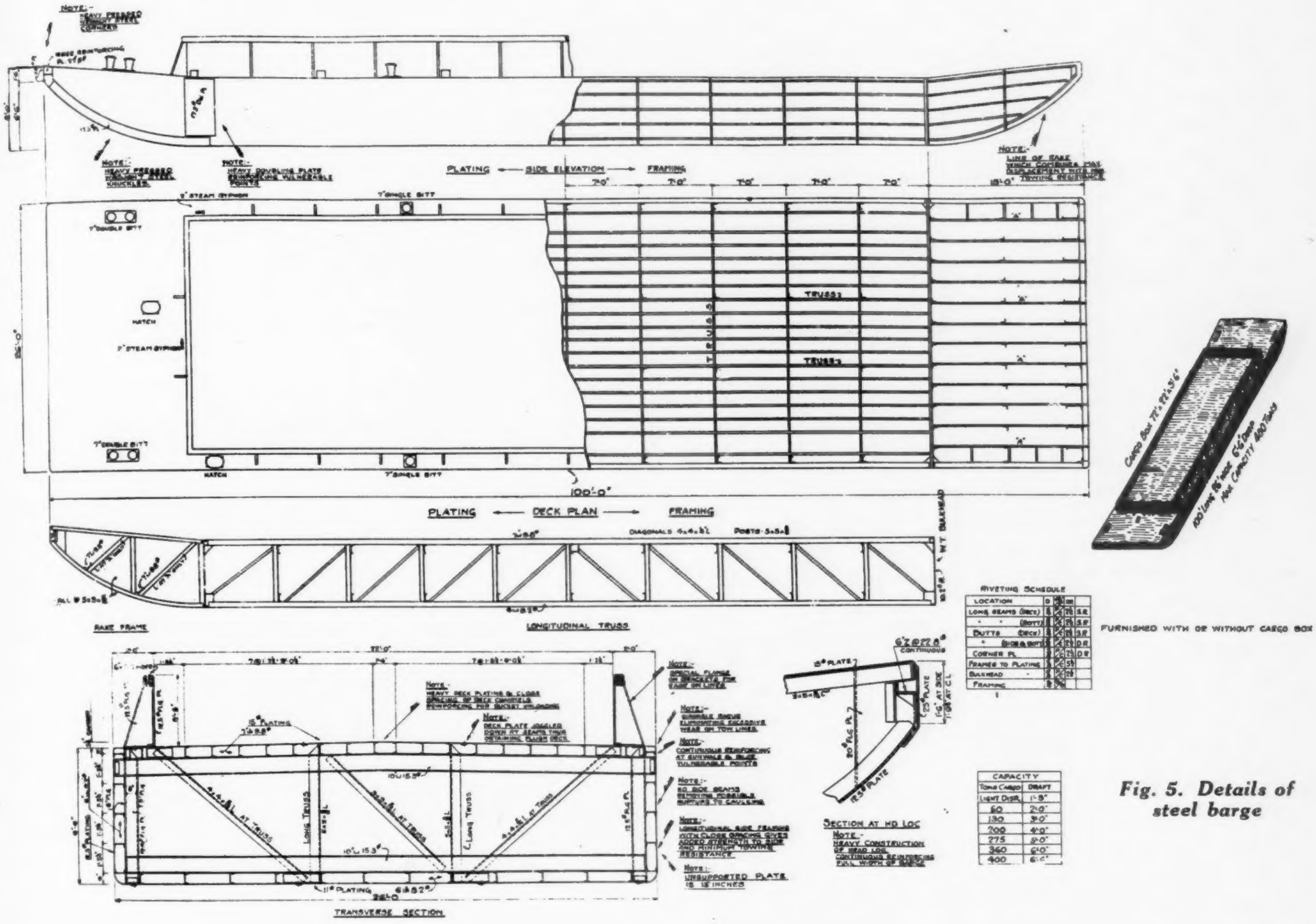


Fig. 5. Details of steel barge

Quarters are provided on board for the crew and in addition a complete kitchen and boarding equipment.

Storage Plant

Sand and gravel brought from the dredges in steel barges is moored to the river bank at Louisville, while the tow boat returns the empty barges to the dredges.

Loaded barges are manipulated under the unloading equipment by means of a double-drum Thomas hoist engine installed on a steel-hulled landing barge or pump boat. This hoist is operated by steam at 100 lb. pressure furnished by a 150-hp., marine-type, water-tube boiler also located on the pump boat. This boat is kept moored at the landing and serves as a landing dock or floating wharf over which supplies are moved to the tow boats. As the name implies, it also supplies power for pumping water from leaking or flooded barges. For this purpose steam from the boiler is used in steam-ejector pumps.

By means of the double-drum hoist loaded barges can be moved in either direction, spotted in position for unloading, and moved as unloading proceeds. The empties are removed and replaced by loaded barges by the same power.

Gravel is unloaded by a Brownhoist bridge crane equipped with a 3½-cu. yd. clamshell bucket. This crane is of steel construction, cantilever type, with an overall reach of 200 ft. The crane is stationary and all barges must be spotted under it.

Paralleling the river and underneath the crane is a railroad spur track on which cars are spotted for direct loading from the barge when necessary. Ordinary procedure, however, involves discharging the crane bucket to a steel hopper of 25 cu. yd. capacity located between the spur and the river bank.

The hopper delivers the material to a 36-in. rubber conveyor belt through a 48-in. steel pan feeder operated through an eccentric. This belt travels at 240 ft. per min. and discharges either direct into railway equipment on the spur after passing over a weightometer, or over a shaking screen with ¼-in. slotted openings to a second 36-in. rubber conveyor belt.

The first belt is about 75 ft. long and operates on an incline of 18%. When discharging over the screen to the second conveyor the gravel is subjected to a final rinsing by a stream of water playing on the gravel as it passes over the screen. The screen is actuated by an eccentric driven from the head-pulley shaft of the first conveyor. Wash water and sand are returned to the river. The initial conveyor is driven by a 10-hp. electric motor operating on 440-volt, alternating current.

The second or main conveyor is 36 in. wide and 600 ft. long and runs up an 18% grade for 75 ft. and level for the balance of its travel except as it rises to pass over the tripper. It is driven by a 35-hp. motor.

This main conveyor delivers through a double-discharge tripper to either of two shuttle conveyors set at right angles to the main conveyor.

Shuttle Conveyors

The shuttle conveyors are driven by 12-hp. motors. The belts are 36 in. wide and 125 ft. long and are reversible in direction. Running in one direction No. 1 shuttle delivers through a movable tripper to a series of seven concrete bins each of which holds 500 tons. These are used as gravel bins and separate such gravel sizes as have been made on the dredge. No attempt is made to resize or grade either sand or gravel except on the dredge.

Delivery from these bins is to auto trucks through hand-operated flat horizontal gates.

Operating in reverse direction this shuttle conveyor delivers gravel to ground storage.

The No. 2 shuttle conveyor is also reversible in direction, delivering to ground storage in one direction and to 6 concrete bins of 350 tons capacity each in the other direction. This shuttle is used to deliver sand to the bins or gravel or sand to storage, as may be required. The bins store the fine, medium, and coarse sand as deliv-

ered by the dredge and discharge to auto trucks.

Either of these shuttles can discharge direct to railway cars on a spur running below them and paralleling the main conveyor.

The No. 2 shuttle conveyor also delivers material beyond the sand bins to a fifth conveyor 24 in. wide which in turn delivers to either of two 24-in. by 260-ft. storage conveyors which discharge to ground storage.

In reverse direction this shuttle delivers to an eighth conveyor 24 in. by 150 ft., which also discharges to ground storage.

Either sand or gravel may be handled by these conveyors as exigencies may require.

Belts Centrally Controlled

Centrally located near the main conveyor is the control room from which all belts may be operated or controlled. All belts may be instantly stopped by push-button control from the control room or from points located at 30-ft. intervals throughout the system. The first belt carrying material from the hopper under the bridge crane may be operated either from the crane or from the control room.

All belts are driven by separate motors operating on 440-volt, alternating current.

The two long storage belts are run by 25-hp. motors and the short storage belt is operated by a 15-hp. motor.

All 36-in. belts operate at a speed of 240 ft. per minute and the 24-in. belts at 320 ft. per minute.

The system has a capacity of 350 tons per hour and is lighted so it can be operated day or night.

The yard has a capacity of 150,000 tons of sand and gravel in ground storage and in addition the railway spurs will hold thirty-five 60-ton cars (see Fig. 6).

Cars spotted on the river spur are moved by a double-drum Thomas elevator hoist and 1½-in. cable controlled by the crane operator. This hoist is powered by a 75-hp. motor and can handle 15 loaded cars at one time. All chutes discharging material from trippers are lined with rubber. These rubber linings have been found to outlast an equal thickness of steel plate many times.

A gasoline-driven caterpillar crane loads railway equipment from storage piles. This crane is equipped with a ½-yd. clamshell bucket.

For wagon or truck loading from storage the yard is equipped with four Barber-Green gasoline-driven portable loaders mounted on caterpillar traction. These loaders are capable of delivering from storage 1 ton per minute each.

There is also provided a Green slip scoop or drag bucket of 1¼ cu. yd. capacity for loading railway cars from storage. This is equipped with a Thomas elevator hoist powered by a 75-hp. motor.

The bridge crane is also used in transferring heavy machinery from shore to river equipment and has a capacity of 10 tons. The crane is powered by three separate motors, one for hoisting, one for closing and one for travel. All are of 150 hp. and interchangeable.

For city delivery the company maintains a fleet of 10 Mack and White 5-ton trucks, all of which are garaged in one corner of the yard which is 600 by 800 ft. in size and entirely floored with concrete.

Machine Shop

In one end of the garage is a completely equipped machine shop wherein all equipment repairs are made as needed.

In unloading barges three men are employed to clean up after the crane bucket.

All storage piles are confined behind 9-ft. concrete retaining walls and the conveyor supports are reinforced concrete with supporting spans of structural steel.

As will be noted in the above description, no provision is made at the land plant for re-screening or grading either sand or gravel. Material is merely transferred from barges to storage bins or railway equipment.

All sizing and grading is done on the dredges and ordinarily two sizes of gravel and three of sand are made. The sand, however, is graded as to color also. Some of the deposits produce a gray sand and others a red sand. These are handled and stored separately for marketing purposes.

Personnel and Wage Rates

Storage-yard crew:	
1 crane man, caterpillar	$6.50
1 hopper tender	4.00
1 car cleaner	5.00
1 wagon loader	6.00
3 barge tenders	4.00
1 operator, bridge crane	7.50
1 belt operator	5.00
1 electrician	7.50
1 car tender	4.00
Steamer Duffy:	
1 pilot	$10.00 and board
1 engineer	7.00 and board
1 mate	4.75 and board
2 firemen	4.75 and board
1 cook	3.00 and board
Dredge Kentucky:	
1 operator	8.00 and board
1 engineer	7.75 and board
1 fireman	4.50 and board
2 deck hands	4.00 and board
1 mate	4.75 and board
1 night watch	4.00 and board
1 cook	3.00 and board
No. 4 Digger:	
1 operator	8.00 and board
1 engineer	7.75 and board
1 oiler	4.00 and board
1 fireman	4.50 and board
2 deck hands	4.00 and board
1 mate	4.50 and board
1 night watch	4.00 and board
1 cook	3.00 and board

Costs

Period Covered—January 1 to December 31, 1927.

Total material loaded:	
Digger No. 4 (Ladder dredge)	743,712 tons
Digger No. 3 (Centrifugal-pump dredge)	73,554 tons
Total dug	817,266 tons
Bridge crane (To storage)	634,596 tons

Costs are shown for the year 1927 rather than more recent figures because during that year the dredging equipment had a minimum of lost time and operating costs are therefore more truly representative of the capability of the different types of equipment.

No. 3 Digger was a centrifugal-pump dredge operating a 10-in. pump. This unit has since been abandoned and the *Kentucky* substituted.

Summary of Costs in Units of Labor

Period covered—January 1 to December 31, 1927.

	Digging	Towing	Storage
Labor— (man-hours per ton)			
No. 3 Digger	$0.12		
No. 4 Digger	.036		
Total digging	.044		
Steamer *Duffy*		$0.022	
Storage yard			$0.061
Total man-hours per ton dug	.114		
Power—			
Kw.h. per ton			0.255
Labor, per cent of total cost			30.0
Supplies and power, per cent of total cost			49.3
Depreciation, per cent of total cost			20.7

Atlas Rock Co. Takes Over Olympia Sand Co.

THE ATLAS ROCK CO., which for the past several years has been operating on the Stanislaus river east of Oakdale, Calif., will henceforth be known as the Atlas Olympia Co., since the consolidation of the two companies recently.

The Atlas Rock Co. has taken over the Olympia Sand Co. of Santa Cruz county.

The new company, as the first move in its enlarged field of activities, has purchased 77 acres of land from A. L. Gilbert, directly across from the Atlas plant.

The plant has now resumed work, after undergoing a complete overhauling. Orders for rock, gravel and sand have been delivered from the accumulated stock. From eight to 12 carloads have been going from the plant daily, most of which is being used on road jobs and construction work in Northern California.—*Stockton (Calif.) Independent.*

OPERATING COSTS PER DRY TON PRODUCED

	Labor		Power		Supplies		Depreciation		Total	
Digging	Total	Per ton	Total	Per ton	Total	Per ton	Total	Per ton	Total	Per ton
No. 3 Digger	$ 7,061.85	$0.096	$ 1,692.72	$0.023	$ 4,168.51	$0.057	$ 2,974.75	$0.040	$15,987.83	$0.216
No. 4 Digger	22,424.75	.030	10,759.28	.015	36,209.86	.049	22,036.57	.029	91,430.46	.123
Towing										
Str. Duffy	11.480.05	.014	7,736.71	.009	3,377.80	.004	5,753.03	.007	28,347.59	.034
Storage	18,841.30	.030	4,050.00	.006	30.727.35	.048	11,234.58	.018	64,853.23	.102

Gypsum and Gypsum Products Manufacture—Part VII

Retarders and Accelerators and Their Action on Plaster and Stuccos

By S. G. McAnally

Chief Chemist, Giant Portland Cement Co., Egypt, Penn.; formerly Chemist for the Pacific Portland Cement Co., Mound House, Nev., and Chemist and Superintendent for the Standard Gypsum Co., Ludwig, Nev.

Synopsis

IN THIS installment the author discusses in detail various admixtures and their effect on gypsum plaster, or stucco.

The function of retarders is described and the results of many tests are given as to the effect of these retarders. Much practical information is given on the testing and commercial application of retarders.

Accelerators and their use are discussed and comparative tests of different accelerators given.

Various fibre admixtures and their functions are described.

Admixtures to increase surface hardness, and experiments, and practicability are discussed.

—The Editor.

VARIOUS INGREDIENTS are added to calcined gypsum in order to effect changes in its properties, such as setting time, strength and hardness, sand-carrying capacity, color, etc. Usually the admixtures are made at the mill.

For some purposes the setting time of plaster of paris is too rapid; for others, it is too slow. In order to quicken the set, an accelerator is added; to slow the set, a retarder is added to the plaster.

Retarders

There are numerous compounds which retard the setting time of gypsum plaster. The list includes gums, starch, borax, molasses, sugar, glue, etc. A review of the patent literature (ROCK PRODUCTS, November 9, 1929) is very interesting. In one process, peas, beans and lentils were used. Another used feathers combined with an alkali. However, only a few retarders are economically important. The retarder generally used today is a product made from the refuse of the stockyards. (For description of process see ROCK PRODUCTS, December 25, 1926.)

Commercial retarder is a finely ground powder. The color varies from a light buff to an olive green. It is strongly alkaline and is very powerful in its retarding action. The addition of about 0.4% to normal setting plaster of paris will retard the set from approximately one-half hour to 24 hours. The addition of various amounts of retarder to single boil stucco gave the following setting time results:

Pounds of retarder per ton of plaster	Setting time
0	30 min.
½	50 min.
1	1 hour 15 min.
2	2 hour 45 min.
3	5 hour 15 min.
4	10 hour
5	16 hour
6	22 hour
7	29 hour

There are several brands of commercial retarder each having different retarding qualities, and the same brand will not be consistently uniform in its efficiency. The efficiency of a retarder (commercial) is supposed to be dependent on the percentage of soluble albuminoids it contains, but the positive and practical test is to mix standard amounts of the retarder to be tested and of one already tested with the gypsum plaster (regular mill batches) and make comparative setting time tests on the different batches, preferably three of each.

Below are given the analyses and fineness tests on four samples of retarder and the amount per ton of each used to obtain the same retarded setting time on the same sample of plaster.

Brand C contains less soluble albuminoids than the first two, yet it is more efficient. The analysis can be very misleading. Some shipments of retarder, from the same manufacturer, which showed higher soluble albuminoid content than previous shipments, have been found by actual mill tests to be 40% less efficient.

The color of the retarder is sometimes a guide to its uniformity. Each brand has a standard color, and any variation from this standard indicates irregularity in the product. With some brands, a darker color than the regular may indicate inferior quality, while with other brands the reverse may be true; i.e., a lighter color may indicate inferiority.

Variation in the fineness of the retarder also affects its efficiency; the coarser it is the more is required to retard the set.

With some brands of retarder the variation in "strength," as it is called, is sometimes very pronounced, even in the same shipment, and the setting time of the plaster (retarded) will be very irregular. To overcome this defect in the retarder, should it exist, the following system of blending is recommended:

The retarder, which usually requires screening to eliminate the lumps, is fed, several sacks at a time, into a hopper above a rotary screen. The screened retarder is conveyed to one of two small bins. The capacity of the bins should be large enough to hold sufficient retarder for two days' mill requirements. While a bin is being filled, its contents should be thoroughly mixed, and when it is full, two or more mill tests should be made on an average sample. The setting time results will be a guide to the amount of the retarder required. When one bin is in use, the other is being filled and tested. Indeed, even where there is considerable variation between different sacks of retarder in the same shipment, the variation between bins may be very little, due to the above method of blending.

Amounts of Retarder Required

The amount of retarder added to plaster varies for the different products, at the different mills, and for the same products but used in different localities.

Casting and similar plasters, as a rule, do not require the addition of a retarder, but when retarder is necessary, the amount seldom exceeds 4 oz. per ton of plaster. Finishing plasters contain from 1 to 3 lb. of retarder per ton. The amount depends on usage in different parts of the country. Fibred and unfibred hardwall plasters contain from 4 to 12 lb. per ton. The great variation in the latter is due to (1) variation in the quality of the retarder; (2) variation in the setting time of the basic material (usually single boil); (3) varia-

AMOUNT OF VARIOUS RETARDERS TO SECURE IDENTICAL RESULTS

Brand	Soluble albuminoids	Insoluble albuminoids	H_2O	Fineness 200-mesh	Pounds per ton
A	18.80%	2.63%	2.25%	80.0%	7.0 lb.
B1	17.63%	3.56%	2.85%	87.0%	9.0 lb.
B2	12.95%	1.92%	3.06%	......	10.5 lb.
C	16.90%	3.80%	2.42%	83.0%	6.5 lb.

tion in activity, towards retarder, of plasters from different sources; (4) different requirements or usage in different localities; (5) differences in climatic conditions at the various consuming centers; (6) local changes in the climatic conditions of each center.

Regarding the two last causes for variation, it can be stated definitely that the setting time of retarded hardwall varies directly as the temperature of the surrounding atmosphere; i.e., the higher the temperature the slower the setting time; and gypsum mills that ship fibred hardwall to several localities which differ climatically from one another customarily add the least amount of retarder to the hardwall shipped to the warmest climate. The reason is twofold. The higher temperature slows the set considerably, and, if the set is too slow, the plaster will dry out before the set has occurred. It was pointed out in a previous article that excess water is essential for the setting action.

The writer did not make any tests to determine if commercial retarders deteriorate or lose "strength" with age. Retarded plasters set slower the longer they are aged, which shows that either the retarder does not deteriorate or that any deterioration is counteracted by the aging effect on the calcined gypsum; aging slows the set. Setting time tests made on the same sack of retarded plaster (7 lb. per ton) which was stored in air for one year gave the following results:

Period stored in air	Setting time 1 part plaster; 3 parts sand
Fresh calcined	5 hr. 40 min.
1 mo.	6 hr. 20 min.
2 mo.	6 hr. 30 min.
3 mo.	6 hr. 50 min.
4 mo.	7 hr. 25 min.
5 mo.	7 hr. 20 min.
6 mo.	8 hr. 00 min.
7 mo.	8 hr. 30 min.
8 mo.	9 hr. 00 min.
9 mo.	8 hr. 40 min.
10 mo.	9 hr. 00 min.
11 mo.	9 hr. 15 min.
12 mo.	9 hr. 20 min.

The relatively small amount of commercial retarder added to plaster does not appear to lower its strength; indeed, retarder seems to give to the set plaster a much harder surface than that possessed by the unretarded and quicker setting product. The comparison, of course, can apply only to neat mixtures.

Among the list of materials mentioned in various publications as retarders for gypsum plaster are sugar-beet pulp, lime and bentonite. H. Struve carried out experiments with sugar-beet pulp and found that it had no value as a retarder. Lime is essentially an accelerator for single- and double-boil plasters. Bentonite, a silicate of alumina, has been tried by the writer, but it did not retard the set.

Small percentages of alum, 0.5% or less, slow the setting time; larger quantities quicken the setting time. Alum has a weak acid reaction, and the action of the stronger solution (more acidic) may be analagous to that of weak solutions of sulphuric acid which accelerate the set.

There are numerous other compounds which will retard the setting time, but, in addition to being detrimental to the quality of the plaster, their use would increase the cost of manufacture.

Fibred Ingredients

Among the ingredients that are added to plaster, hair and fibre come next in importance to retarder. Large quantities are used in the gypsum industry. Hair and manila rope fibre are added to hardwall plaster for the purpose as serving as a binder and for preventing the laths from buckling. Wood fibre (made from cotton-wood) gives bulk and lightness to the hardwall plaster and deadens the sound-conveying qualities.

Tests made on retarded hardwall to determine the effect of hair and manila fibre on the tensile strength gave the following results:

	7-day tensile strength, 1-3 sand
No fibre or hair.	268; 395, avg. 382 lb.
4 lb. fibre per ton.	380; 388, avg. 384 lb.
4 lb. hair per ton.	385; 410, avg. 397 lb.

Hair improves the strength slightly; the gain due to the addition of the manila fibre is negligible.

The amount of hair or manila fibre added to each ton of hardwall varies from 3 to 7 lb. Between 20 and 35 lb. of wood fibre are added to each ton of plaster. Wood fibre is not used to any great extent, and the present day tendency is to decrease the amounts of hair and manila fibre that are added to plaster as the benefits obtained or desired through their use are not always apparent.

Accelerators

Accelerators are added to calcined gypsum in order to quicken the setting time. Raw gypsum is the cheapest form of accelerator (when added at the mill), but only under certain conditions can it be depended upon to give dependable and uniform acceleration. The amount of raw gypsum required to quicken the set of a plaster from 20 min. to 5 min. may vary between 10 and 100 lb. per ton of plaster. The higher the temperature of the plaster, the greater is the quantity of raw required. Cold plaster is very susceptible to the action of *dry* raw gypsum; between 8 and 12 lb. per ton will hasten the set from 20 min. to 5 min. When this small amount of gypsum is mixed with hot plaster, a very slight acceleration takes place; the raw is partially dehydrated by the heat from the plaster and ceases to function fully. Therefore, much larger amounts, from 50 to 100 lb. per ton, are added to the hot plaster in order to hasten the setting time to approximately 5 min.

Large amounts of raw gypsum weaken the strength of the plaster. It is not always practical to cool the latter before adding the raw; and, due to the increasing number of new plaster products, especially quick-setting ones, which are required to set in from 3 to 5 min., and to the necessity for more economical methods of manufacture and the demand for stronger products, other substances are replacing raw gypsum as accelerators.

Another disadvantage in using raw gypsum for this purpose, especially with *cold* plaster, is this: if the ground raw gypsum is moist, or damp (and many gypsum mills do not dry the raw gypsum), as much as 60 lb. per ton may be required to accelerate the set of cold plaster to 5 min. The results of tests given below show the effects of various amounts of raw, moist and dry on the set of cold, double-boil plaster.

Common salt (sodium chloride) has been used, for many years, as a plaster accelerator, and, unlike raw gypsum, it is unaffected by the temperature of the plaster. The physical condition of the salt, whether in powdered form, wet or dry, or in solution, does not affect its efficiency. Solutions of raw gypsum do not accelerate the setting time. A mixture of common salt and raw gypsum is a very efficient accelerator, but it possesses the same disadvantages as raw gypsum; i.e., the amount of the mixture to be added to the plaster varies directly as the temperature of the latter and with the quantity of moisture in the former.

Comparative Tests of Accelerators

Potassium and sodium sulphates are good accelerators. However, sodium salts, especially the sulphate, sometimes cause efflorescence on the surface of the set plaster, an objectionable feature. The table on following page, giving results of setting time tests on cold plaster which had been mixed with varying amounts of different accelerators, brings out the comparison.

Nearly all soluble chlorides and sulphates quicken the setting time of calcined gypsum.

EFFECT OF ADDITION OF RAW GYPSUM ON SETTING TIME

Condition of raw gypsum		
	Setting time of plaster, no raw added	16 min.
Moist	Setting time of plaster + 8 lb. per ton	11 min.
	Setting time of plaster + 12 lb. per ton	10 min.
	Setting time of plaster + 16 lb. per ton	9 min.
	Setting time of plaster + 18 lb. per ton	8½ min.
	Setting time of plaster + 20 lb. per ton	7½ min.
	Setting time of plaster + 40 lb. per ton	6½ min.
	Setting time of plaster + 60 lb. per ton	6 min.
Same raw partially dried	Setting time of plaster + 10 lb. per ton	8 min.
	Setting time of plaster + 15 lb. per ton	5½ min.
	Setting time of plaster + 16 lb. per ton	5 min.
Same raw thoroughly dried	Setting time of plaster + 8 lb. per ton	5 min.

EFFECT OF VARIOUS ACCELERATORS ON SETTING TIME

Plaster used, and setting time	Accelerators, lb. per ton, and set in minutes — Dry raw gypsum	Set	Sodium chloride	Set	Sodium sulphate	Set	½ raw ½ salt	Set
Single-boil, 20 min.	5	9	5	12	5	10	....	....
	10	7	10	11	10	7	....	....
	20	4	20	8	20	5	20	3½
Single-boil, 48 min.	....	....	5	35	5	30	....	....
	....	....	10	27	10	25	....	....
	....	....	15	22	15	18	....	....

The oxides and hydrates of calcium and magnesium are accelerators, as also is portland cement, which, although it contains only 60% lime (approximately), is even more efficient than pure lime oxide or hydrate.

Natural anhydrite and dead-burned gypsum accelerate single- and double-boil plasters. Dilate solutions of sulphuric and hydrochloric acid hasten the set. Indeed, the majority of substances commonly met with quicken the set of calcined gypsum.

Raw gypsum and common salt each accelerate the set of retarded hardwall, but, when a mixture of the two accelerators was added to the retarded plaster, very unusual and unexpected results were obtained by Struve whose experimental results are given below.

The above results would indicate that the salt acted as a retarder in the presence of the raw gypsum. The writer made tests somewhat similar to the above, and the results showed that although sodium chloride does not accelerate the setting time of the retarded plaster as much as does dry raw gypsum, a mixture containing equal parts of raw gypsum and sodium chloride is equivalent to raw gypsum alone.

Admixtures to Increase Surface Hardness

Many attempts have been made to increase the surface hardness of the set plaster by mixing various ingredients with the dry powder or in the mixing water. In the meager literature on the subject, the following two formulas for hardeners are the ones most generally given: (1) Mix the plaster with a weak solution (½ oz. to 1 pint of water) of gum arabic, or a weak solution of size; (2) add to the plaster of paris 2% to 4% powdered marshmallow; root dextrine, glue or gum arabic may be used instead of the marshmallow.

The writer investigated the above formulas by making actual tests, and did not find that the plaster benefited by the treatment.

The search for a hardener antedated the researches into the processes of rapidly aging plaster. With the development of successful aging processes, the need for hardeners was not so apparent, as aging the plaster increased the surface hardness. However, the addition of some compounds to the plaster increases the strength and hardness. Manganese sulphate and some soluble borates increase the strength and hardness; potassium sulphate is also beneficial in this respect, but as the chemicals, which act as hardeners, accelerate the setting time, necessitating the addition of a retarder, the slight increase in hardness hardly justifies additional cost of manufacture.

Some materials which increase the surface hardness also improve the waterproofing qualities of the plaster. The harder the outer surface of the set plaster, the greater will be its resistance to weathering, and a plaster that has a low water absorption and which has been treated or mixed with a suitable hardener will resist weathering much better than ordinary plaster.

Barium hydrate suggests itself as a suitable waterproofing material. It is very soluble in water and will react with the calcined gypsum (in solution) to form insoluble barium sulphate and calcium hydrate; the latter, in small quantities, increases the strength and hardness of the plaster. Until the present time no satisfactory method of waterproofing calcined gypsum has been developed.

The water ratio or sand carrying capacity of plaster can be increased by the addition of finely ground siliceous materials such as volcanic ash, diatomaceous earth, bentonite, dried clays, etc. These substances have a higher water ratio than the pure plaster; this accounts for the improvement; no chemical reaction takes place between the plaster and the adulterants. The addition of a small amount of soap powder to the plaster will also increase its sand carrying capacity. In this case, the reaction is chemical. Insoluble calcium salts of the fatty acids, precipitated from the calcium sulphate solution, increase the wet volume.

The use of adulterants in order to enrich the plaster usually increases the cost of manufacture. Besides, many of them are hygroscopic, and the benefits derived from their use are often only temporary. Their presence in the plaster promotes aging. Proper treatment of the raw and the calcined gypsum is the cheapest and surest method of producing plaster having the maximum sand carrying capacity for the particular grade of raw gypsum used.

Colored Plasters

Colored plasters are prepared by mixing, with the dry plaster, one or more pigments. The pigments used in the manufacture of the colored plasters used for interior and exterior work in many of the buildings of the Panama-Pacific International Exposition (1915) were raw umber, burnt sienna and yellow ochre. When two or more colors are used to produce a particular tone, it is preferable to blend the dry colors before mixing them with the dry plaster.

(To be continued)

Index to A. S. T. M. Standards

THE American Society for Testing Materials has issued an index which constitutes a combined index to all A. S. T. M. standards and tentative standards in effect as of September, 1930.

The index is designed to be of service to those familiar with the society's standards in locating any specification or method of test in the bound publications in which it appears, and, as well, to those interested in ascertaining if the society has issued any standards on a specific subject.

STRUVE'S EXPERIMENTS WITH RAW GYPSUM AND SODIUM CHLORIDE

Retarded plaster	Raw gypsum added	Sodium chloride added	Setting time 1-3 Std. sand
100 gram	none	none	5 hr. 40 min.
100 gram	0.125%	none	2 hr. 00 min.
100 gram	0.25 %	none	1 hr. 20 min.
100 gram	0.40 %	none	1 hr. 00 min.
100 gram	0.60 %	none	0 hr. 55 min.
100 gram	0.125%	0.125%	4 hr. 00 min.
100 gram	0.25 %	0.25 %	3 hr. 40 min.
100 gram	0.40 %	0.40 %	3 hr. 00 min.
100 gram	0.60 %	0.60 %	2 hr. 40 min.

THE WRITER'S EXPERIMENTS WITH SAME RETARDERS

Retarded plaster	Raw gypsum added	Sodium chloride added	Setting time 1-3 Ottawa sand
33.3 gram	none	none	9 hr. 50 min.
33.3 gram	none	0.05 gram	8 hr. 24 min.
33.3 gram	none	0.10 gram	7 hr. 08 min.
33.3 gram	none	0.15 gram	6 hr. 23 min.
33.3 gram	none	0.20 gram	5 hr. 50 min.
33.3 gram	none	0.30 gram	5 hr. 20 min.
33.3 gram	0.05 gram	none	4 hr. 05 min.
33.3 gram	0.10 gram	none	3 hr. 05 min.
33.3 gram	0.15 gram	none	2 hr. 22 min.
33.3 gram	0.20 gram	none	2 hr. 03 min.
33.3 gram	0.30 gram	none	1 hr. 43 min.
33.3 gram	0.05 gram	0.05 gram	3 hr. 22 min.
33 3 gram	0.10 gram	0.10 gram	2 hr. 16 min.
33.3 gram	0.15 gram	0.15 gram	1 hr. 36 min.
33.3 gram	0.20 gram	0.20 gram	1 hr. 20 min.
33.3 gram	0.30 gram	0.30 gram	0 hr. 54 min.

Study of a Group of Crushing Plants in the Central West

Part V—Crushing and Screening

By Earl C. Harsh
Associate Editor, Rock Products

AS NOTED in the previous articles of the series, this investigation covered some 30 plants producing commercial crushed stone, taken as they came, both large and small, and with no attempt to pick out what might be considered "the best" operations.

The methods of crushing and screening, as well as washing, were found to vary considerably; and in fact are not the same at any two plants, as is shown by the flow sheets of a number of them.

Washing

Washing is now being done at 60% of the plants covered by this investigation; all sizes being washed at 23% of the plants; the Nos. 3, 4 and 6 sizes (below 1½-in. size) being washed at another 23%; and the Nos. 4 and 6 sizes only (below 1-in. size) being washed at 14% of the plants. This washing at all but one of the plants consists in spraying clean water on to the stone as it passes over the screens. In one instance a barrel scrubber is used preliminary to the spraying at the sizing screens. Water in the ratio of about 1000 gal. per min. for an output of 1500 tons per day of 10 hours is generally used at pressures up to 40 lb. or more per square inch—a good pressure is important, less water at high pressure being more effective than the reverse.

Primary Crushing

For primary crushing gyratory type crushers predominate, being used at 25 of the 30 plants. Jaw crushers are used at four plants and a set of Edison type rolls at one. Only two sizes of jaw crushers were found, 84 in. by 66 in. at two plants, and 60 in. by 48 in. at two plants.

The gyratory crushers range all the way from the No. 21 size, with a 42-in. opening, down to the No. 7½ size with a 15-in. opening, the size used being in accordance with the thickness of rock strata, as well as the tonnage to be crushed, in order to minimize so far as possible the delays resulting from the rock being in too large pieces to readily enter the receiving opening of the crusher. Where the rock is in thick layers and blasts out in large pieces crushers with large receiving openings are used, while where the rock is thinly stratified a No. 9 or No. 8 or even a No. 7½ gyratory crusher gives satisfactory results. Gyratory crushers of the 42-in. size are used at seven of the plants, and of the 30-in. size at four plants.

As stated in a previous article, an incline is used at 20 of the 30 plants for hoisting the cars from the quarry to the primary crusher. At the other 10 plants the primary crusher is located at a level low enough to permit dumping the cars from the quarry tracks, and at these plants the quarry cars are all of the side-dump type. Where an incline up to the primary crushed is used, 11 of the plants have end-dump cars which are automatically tripped and emptied over the primary crusher, the balance being of the side-dump type which are for the most part power dumped by means of a cable and hook controlled by the hoist operator.

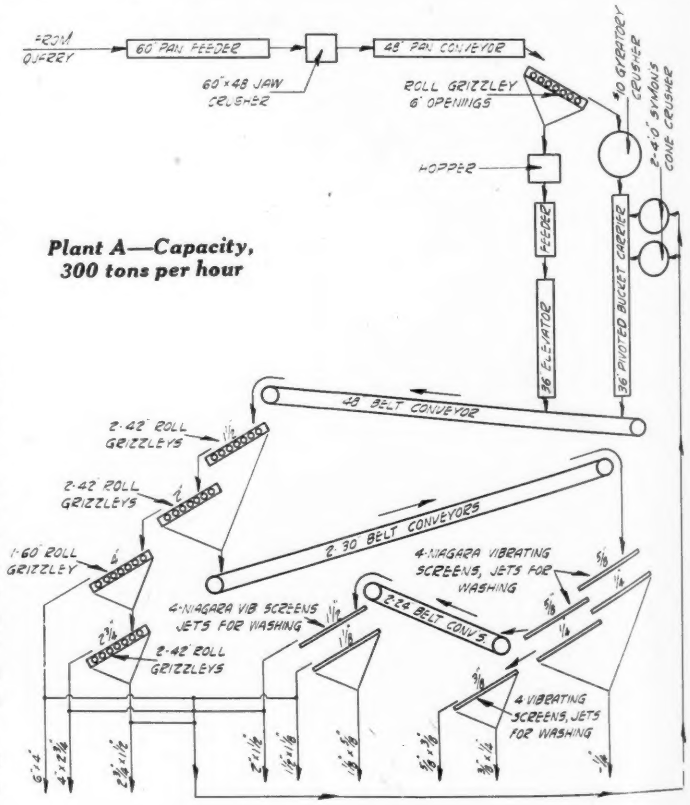
At a number of the plants this has been worked out in an ingenious manner by adding a second drum to the hoist and using that power through a cable and hook. The cable is led from the drum through an overhead sheave to a large hook which engages the side of the car, while another cable attached to the hook and leading back over a sheave to a counterweight pulls the hook away from the car when the dumping cable is slack, and also serves to pull the car body back to its normal position. A slightly different arrangement is used to accomplish the same thing at another plant by using a double drum with the dumping cable wound in one direction and leading through an overhead sheave to the dumping hook, while the pull-back cable is wound on the other half of the drum in the reverse direction and attached to the hook through a sheave on the side. These contrivances require a careful adjustment, but when once worked out give complete and smooth control of the dumping, and of course take the pace of at least one man.

For hooking the large stones which sometimes bridge over the crusher openings a heavy square hook made of 1½-in. by 6-in. steel bar is generally used, along with another drum hoist, the hoist cable passing through a sheave above the crusher to the hook.

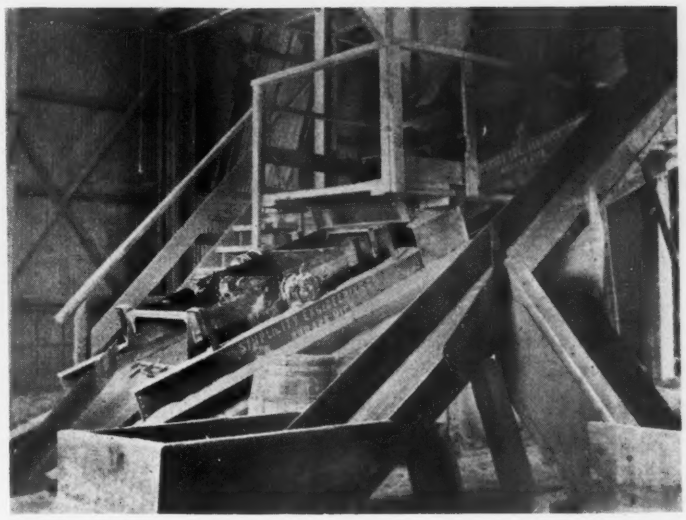
Hoisting on Inclines

The hoisting of the quarry cars at those plants which have an incline is done by three different types of hoists. Drum hoists driven by slip-ring, variable-speed motors either geared directly or through Texrope drives are used at nine of the plants, with motors ranging from 60-hp. to 225-hp., depending upon the size of the cars and the incline. Hoists of the friction wheel type are used at seven plants, five of which are belt-driven and two connected into the main line shaft, while steam hoists are used at the other four plants (these being steam driven plants). Of these various types of hoists the variable-speed, motor-driven hoist with drum controller gives more positive and easy control and is the most satisfactory, everything considered.

The crushed stone from the primary crusher is elevated or conveyed to the scalp-



Plant A—Capacity, 300 tons per hour



Double-deck vibrating screens used for sizing at Plant B

ing or sizing screens on either belt conveyors or bucket elevators, except in one instance where an installation of two 10-ton balanced skip hoists is used.

Scalping

Scalping (without sizing) is done at only 10 of the plants, the oversize or rejections at the other 20 plants being taken out in the main or first sizing screen. This scalping is done in 60-in., 72-in. and 84-in. revolving screens at six of the plants, on roll grizzlies at two of the plants and on 4-ft. by 8-ft. vibrating screens at two plants; the revolving screens handling from 100 to 300 tons per hour each, the roll grizzlies 200 to 300 tons per hour each, and the vibrating screens approximately 100 tons per hour.

Belt conveyors of 30-in., 36-in. and 44-in. widths are used at four of the plants for moving the crushed stone from the primary crusher to the screens, while the use of belt bucket elevators and pan conveyor type elevators is about equally divided at the other 25 plants. Belt-bucket elevators of the type originally used in the industry and in sizes from 24-in. up to 48-in. width are still used at 12 of the plants.

Pan conveyor type elevators from 24-in. to 54-in. width and running on tracks are used at 13 of the plants. This type is used in all the later plants and the rebuilt plants, as it has been found to give the best results with the least trouble, although a belt conveyor is generally more satisfactory than either type of bucket elevator.

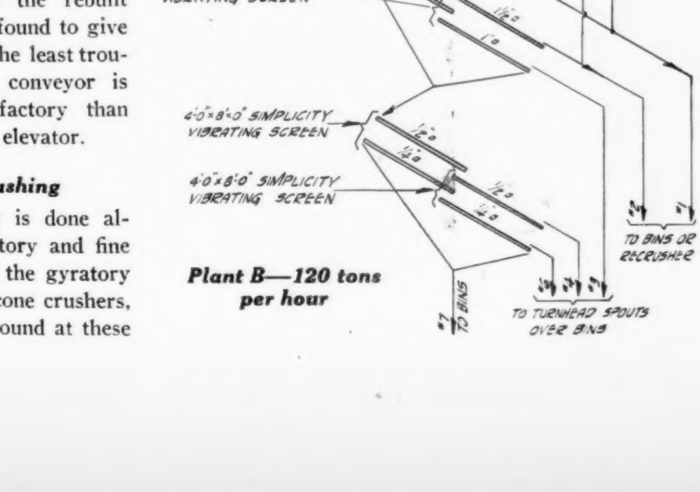
Secondary Crushing

Secondary crushing is done almost entirely in gyratory and fine reduction crushers of the gyratory type, and in Symons cone crushers, the only other types found at these plants being smooth crushing rolls at two plants and a Symons disc crusher at another. The Symons cone crusher, because of its large capacity and good performance on fine crushing, has come into very general use during the past two or three years and seems to be particularly well adapted to producing large quantities of the smaller sizes such as No. 4 and No. 6, or the minus 1-in. sizes.

This type of crusher is used at 17 of the 30 plants under consideration, being used alone for all recrushing at seven of the plants and in conjunction with other types at 10 plants.

Gyratory type crushers are used at 22 of the plants, these doing all of the recrushing at 12 plants and being used in connection with Symons cone crushers at the other 10. The cone crushers at these plants range from the 3-ft. size up to the 5½-ft. size, 80%, however, being of the 4-ft. size.

The screen arrangements for sizing the crushed stone differ considerably at the various plants, and are described briefly below for a number of the plants, reference being made to the accompanying flow sheets.



Plant B—120 tons per hour

The trend during the past few years has been toward the greater use of roll grizzlies and vibrating screens, particularly the latter, until at the present time seven of the plants in this group or practically one-fourth have no revolving screens, all sizing being done on vibrating and shaking screens except at one plant where two of the larger sizes are made on roll grizzlies.

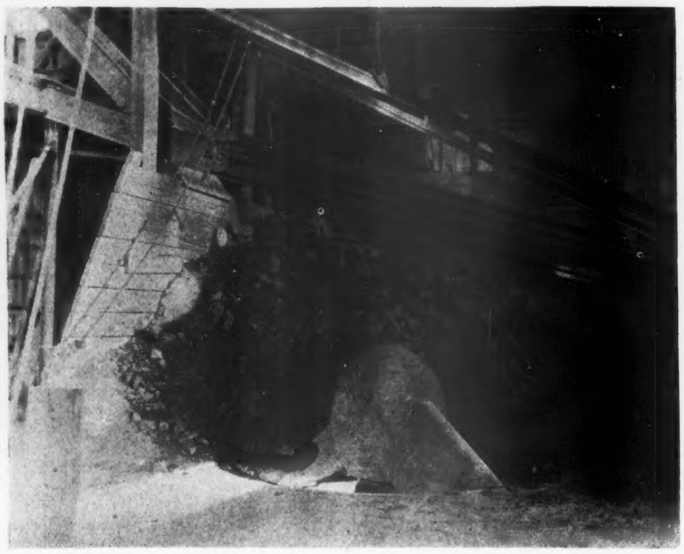
At the balance of the plants where both revolving and other types of screens are used, the primary revolving screens range from 7 ft. diam. by 24 ft. long down to 4 ft. by 20 ft., while the secondary screens range down to 3½ ft. diam. by 16 ft. long. In addition to these revolving screens, inclined vibrating and shaking screens of practically all types are used, including Hummer, Niagara, Robins, Rotex, Simplicity, Traylor and Universal.

At five of the plants Robins roll grizzlies are made use of to clean the No. 1 and No. 2 sizes, which is done dry. In addition to the revolving screens two Robins vibrating screens are used at one plant and two Niagara vibrating screens are used at another to separate the No. 4 and No. 6 sizes dry, while Rotex screens are used at three plants for washing the No. 4 and No. 6 sizes. At four plants Traylor vibrating screens and at three plants Universal vibrating screens are used to make agricultural limestone from the No. 7 size.

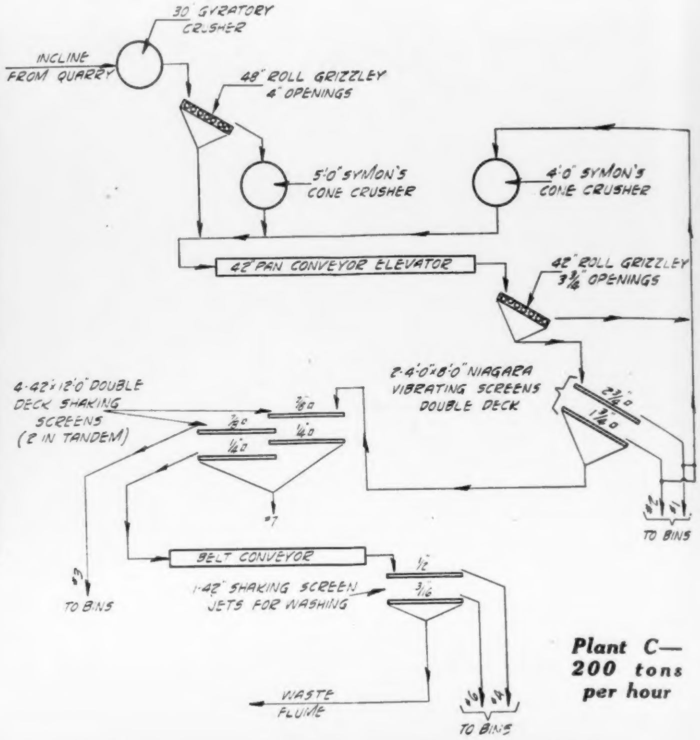
In the flow sheets and descriptions of the screening arrangements the sizes produced are designated by number and for all practical purposes may be considered to be approximately as follows:

No. 1—4-in. by 2½-in.
No. 2—2½-in. by 1½-in.
No. 3—1½-in. by 1-in.
No. 4—1-in. by ½-in.
No. 6—½-in. by ¼-in.
No. 7—Minus ¼-in.
No. 8—Minus ⅛-in. (agstone).

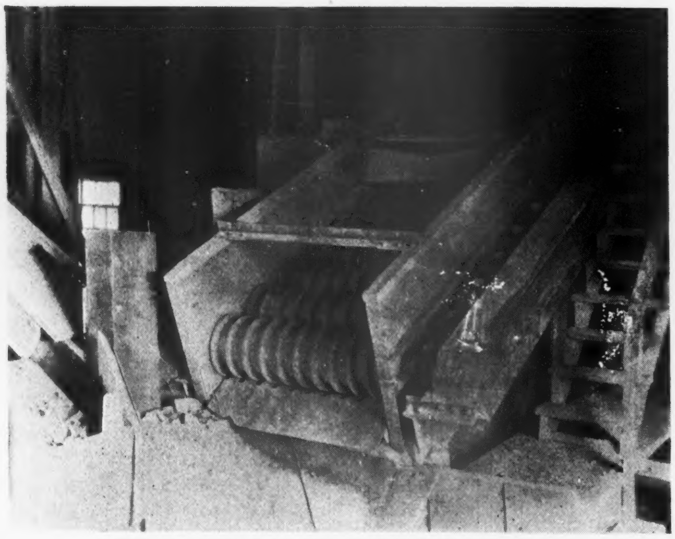
However, the various sizes are not always strictly in accordance with the above, as screen sizes are varied to meet local require-



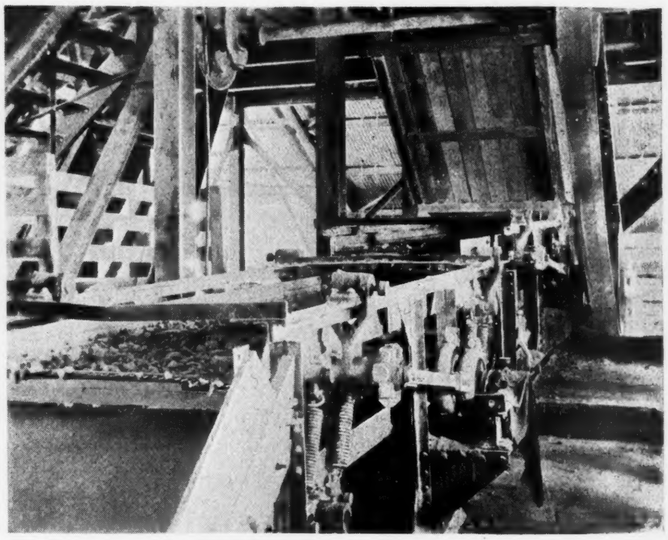
Plant C—Dumping point at gyratory crusher, showing tripping rails for opening door of end dump car



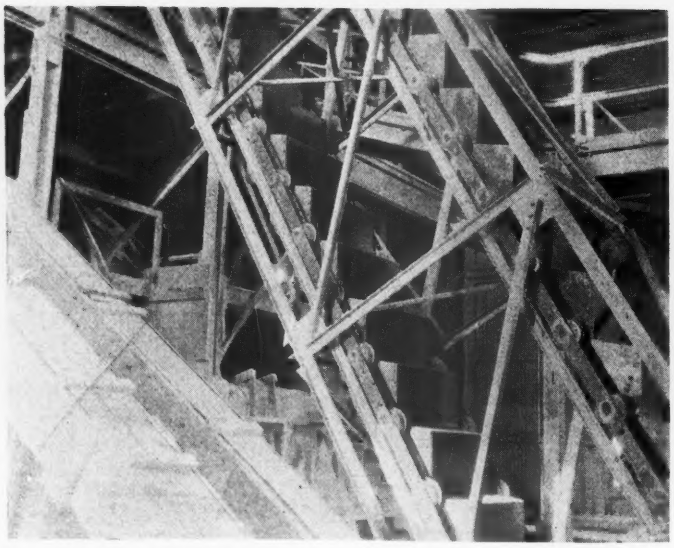
Plant C—200 tons per hour



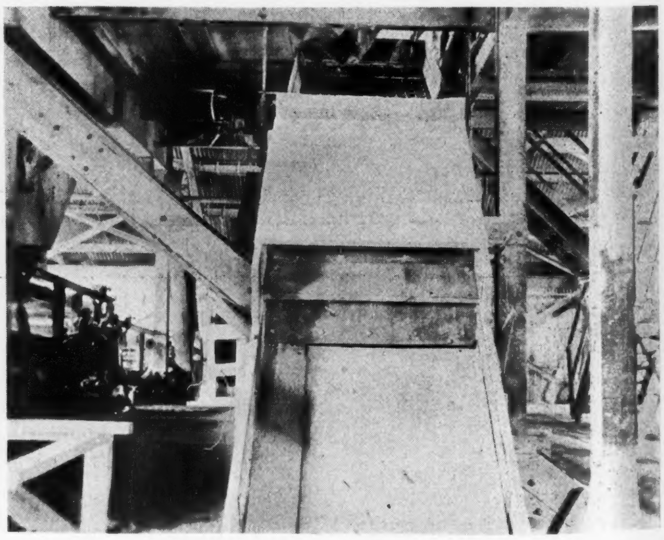
Plant C—Roll grizzly used for scalping



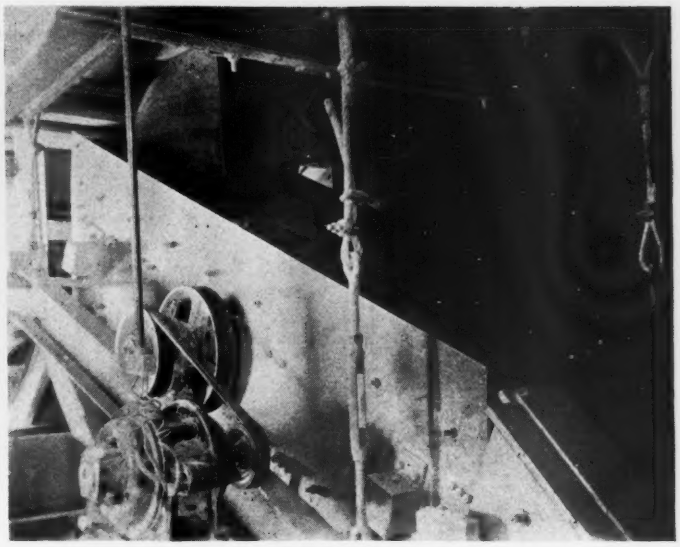
Two double-deck shaking screens in tandem



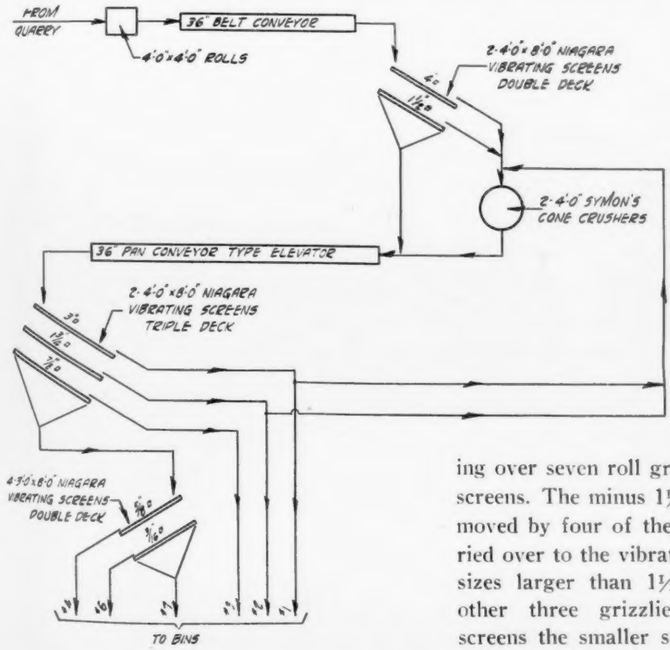
Plant C—Modern conveyor type steel bucket elevator



Simple gates for mixing sizes



Plant D—Vibrating screens for all sizing, showing method of support by wire cables



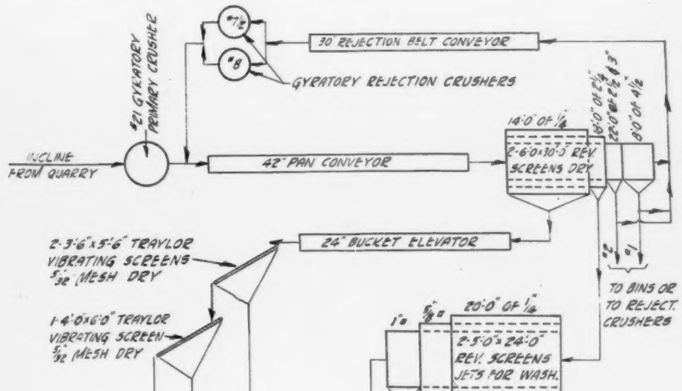
Plant D—100 tons per hour

ments, and of course the specifications also allow a tolerance of 5% to 10% or more.

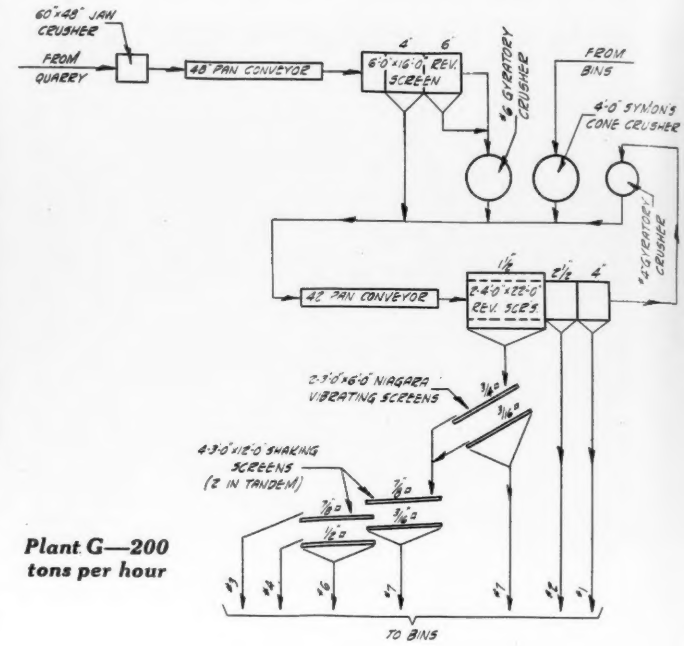
Plant A—This is probably the most modern and complete plant in the whole district and one in which the general plan as well as all details have been most carefully worked out. Here the scalping is done over a single roll grizzly and the sizing over seven roll grizzlies and 16 vibrating screens. The minus 1½-in. sizes, are first removed by four of the roll grizzlies and carried over to the vibrating screens, while three sizes larger than 1½-in. are made on the other three grizzlies. On the vibrating screens the smaller sizes are taken out first and then the larger sizes, as shown, washing with jets being done on all of these vibrating screens.

Plant B—At this plant, which was rebuilt about two years ago, Simplicity vibrating screens are used throughout. Three 4-ft. by 8-ft. double-deck screens make the separation on the oversize, No. 1, No. 2 and No. 3 sizes, one screen taking off the oversize and No. 1 size, and two screens in tandem below taking off the No. 2 and No. 3 sizes. The No. 4, No. 6 and No. 7 material passing through the lower decks of these screens spouts to two 4-ft. by 8-ft. double-deck screens in tandem, where the separation of the No. 4, No. 6 and No. 7 sizes is made. In addition to these five screens a 3-ft. by 6-ft. single-deck "super-vibrator" screen of the same type is used to clean the No. 1 size as it is loaded from the bin into railroad cars. This is the most simplified and compact screening arrangement of any of the plants, and the results are said to be most satisfactory. A feature of interest in this installation is that the No. 3, No. 4 and

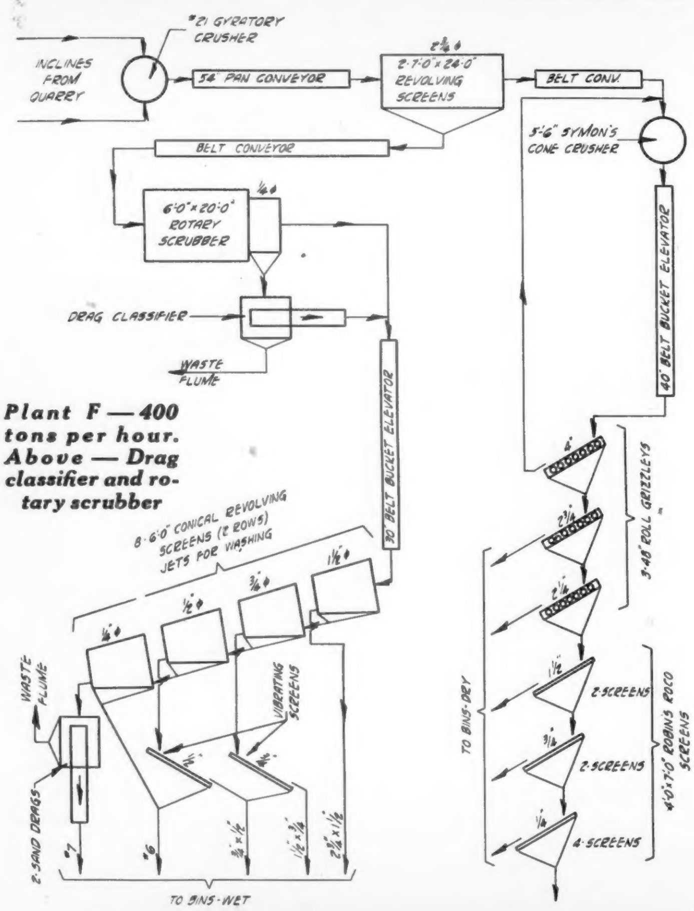
Plant E—Vibrating screen used for making agstone



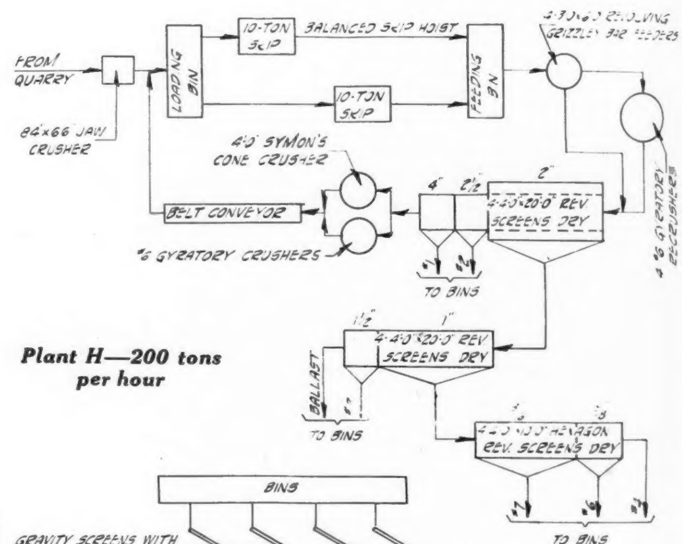
Plant E—250 tons per hour. Revolving screens are used except in the production of agstone



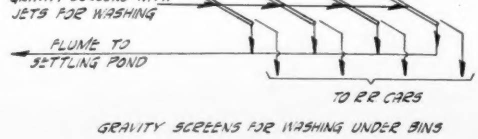
Plant G—200 tons per hour



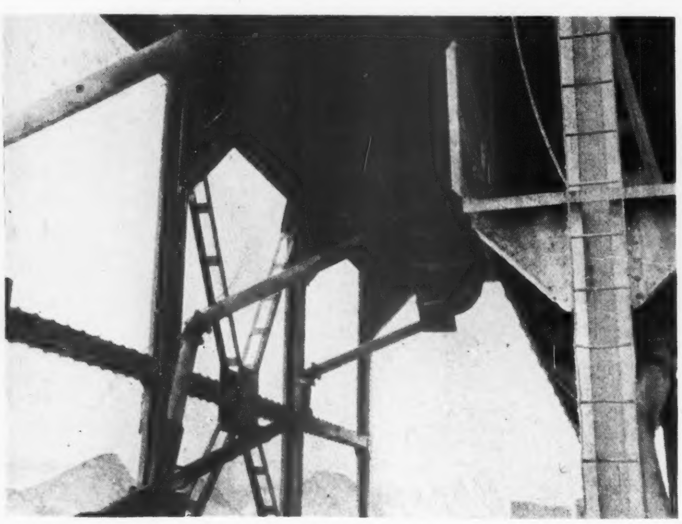
Plant F — 400 tons per hour. Above — Drag classifier and rotary scrubber

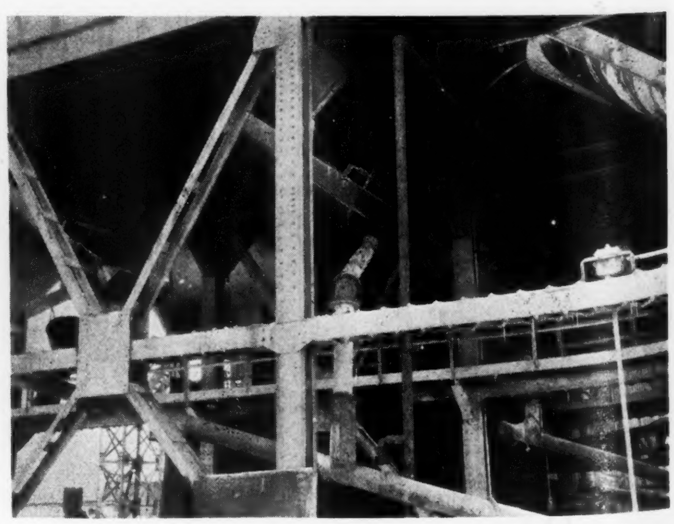


Plant H—200 tons per hour

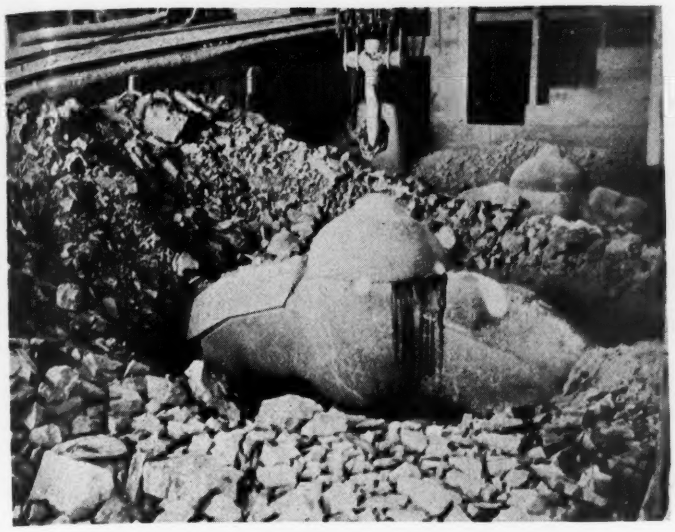


GRAVITY SCREENS FOR WASHING UNDER BINS

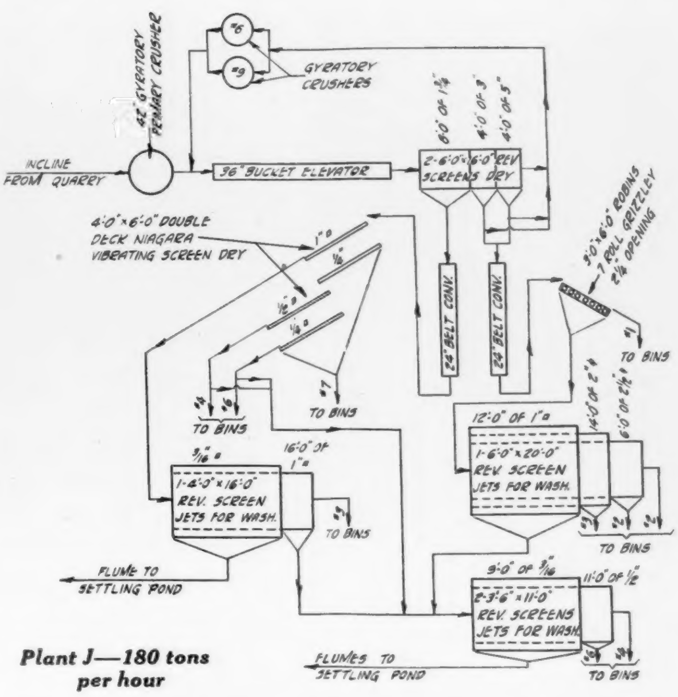




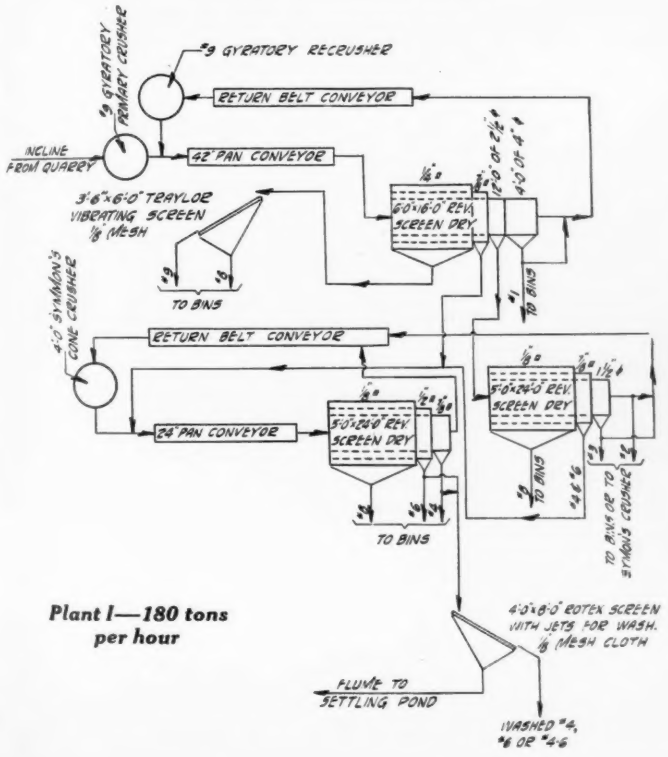
Plant H—Gravity screen washing arrangements under loading bins



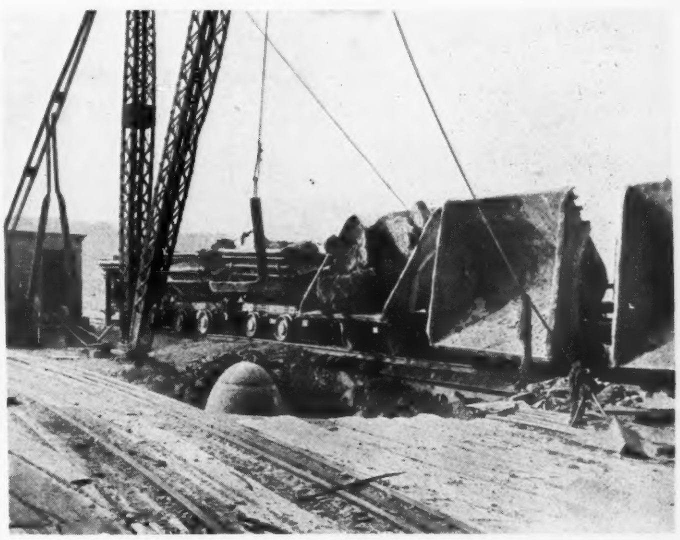
Plant I—Car dumping point at primary crusher showing well broken stone from quarry



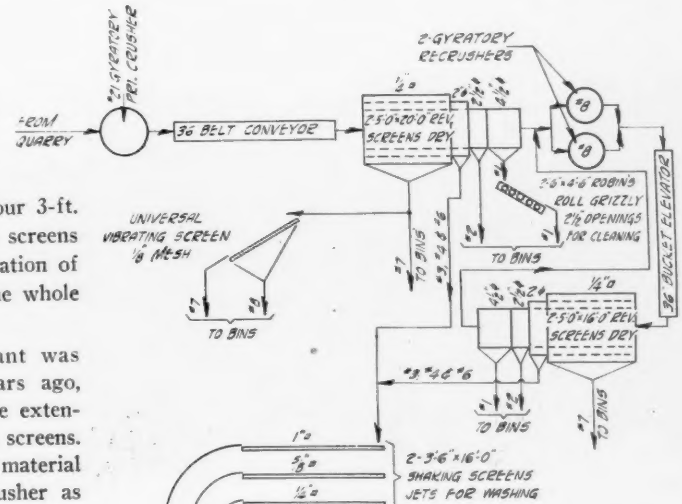
Plant J—180 tons per hour



Plant I—180 tons per hour



Plant K—Small side-dump cars feeding large gyratory crusher



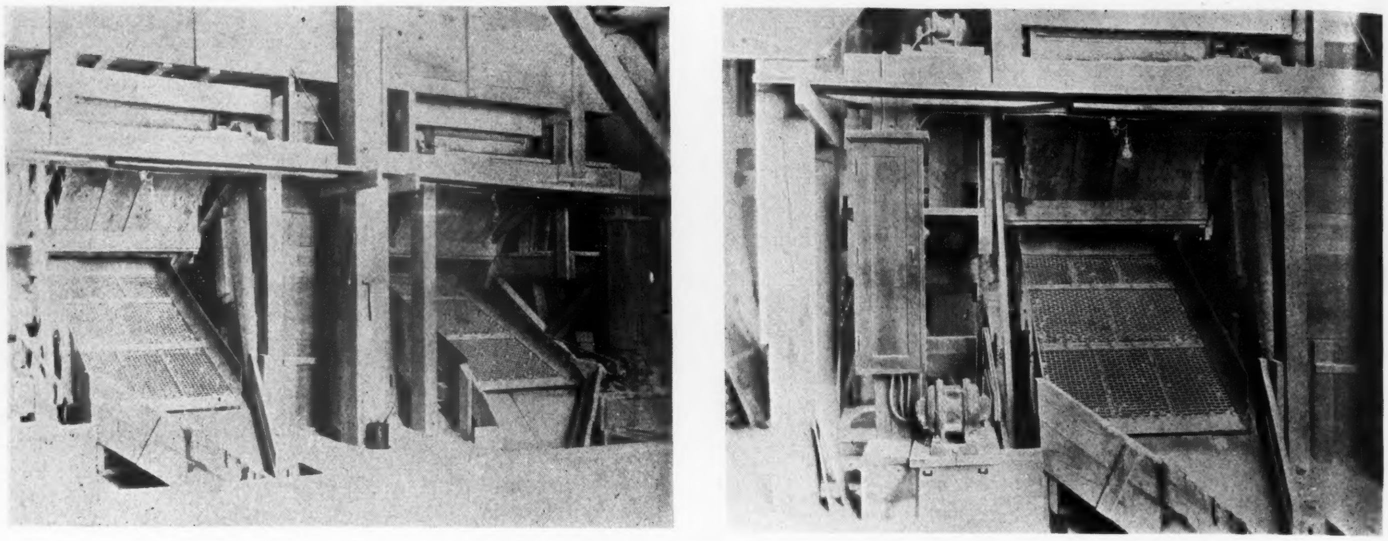
Plant K—180 tons per hour

No. 6 sizes each spout to a hopper and turnhead spout above the bins arranged so that any one of these sizes may be directed into one of several bins or may be mixed with other sizes as desired. All screening is done dry.

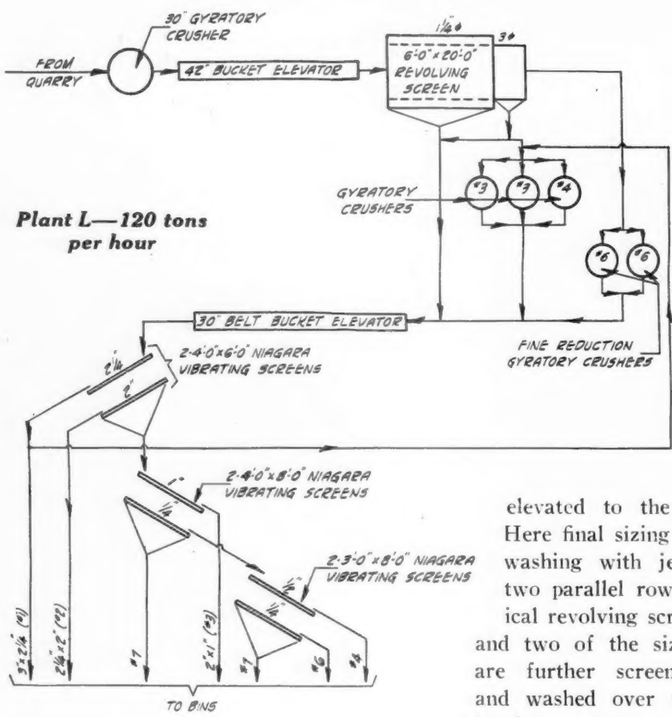
Plant C—Here also coarse sizing is done on roll grizzlies and the finer sizing on vibrating and shaking screens. The larger sizes, No. 1 and No. 2, are taken out first on two 4-ft. by 8-ft. double-deck screens, then the No. 3 and smaller sizes on four shaking screens, washing of the No. 4 and No. 6 sizes being done on an additional shaking screen, and the balance of the operation being dry.

Plant D—Here all screening is done on vibrating screens, two 4-ft. by 8-ft. screens doing the scalping, while two 4-ft. by 8-ft. triple-deck screens separate out the No. 1, No. 2 and No. 3 sizes, passing the smaller sizes to four 3-ft. by 8-ft. double-deck screens which make the separation of the smaller sizes. The whole operation is dry.

Plant E—This plant was built about three years ago, just prior to the more extensive use of vibrating screens. Here all the crushed material from the primary crusher as well as the recrushed material is elevated to two parallel 6-ft. by 30-ft. double-jacketed revolving screens where the



Vibrating screens on two different floors at Plant L, which have replaced revolving screens



Plant L—120 tons per hour

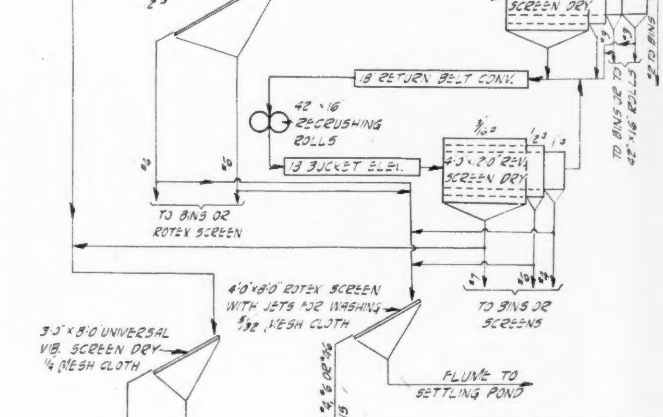
oversize is separated out and returned for recrushing, the No. 1 and No. 2 sizes spouted to the bins, and the Nos. 3, 4 and 6 spouted to two parallel 5-ft. by 24-ft. double-jacketed revolving screens, where these sizes are washed. The minus ¼-in. material from the primary screens is passed over three Traylor vibrating screens with 5/32-in. mesh cloth to obtain No. 8 or "agstone."

Plant F—This was the first of these plants to go to washing and does a very complete job of it. Here everything below 2¾-in. from the primary crusher is washed, the larger sizes and the recrushed material being sized dry, over three roll grizzlies and eight inclined vibrating screens as indicated on the flow sheet. The minus 2¾-in. material is first passed through a 6-ft. by 20-ft. rotary scrubber which is essentially a steel drum with flights, and in which the stone is thoroughly scoured in water. This is the only plant in this group where such a scrubber is used. The minus ¼-in. material and water are removed through a perforated screen at the discharge end and flumed to a drag from which the dirty water flows to a settling pond in the quarry, while the fine material discharged by the drag unites with the rest of the material from the scrubber and is elevated to the screen over the bins. Here final sizing and additional washing with jets is done in two parallel rows of four conical revolving screens in tandem and two of the sizes are further screened and washed over vibrating screens as shown.

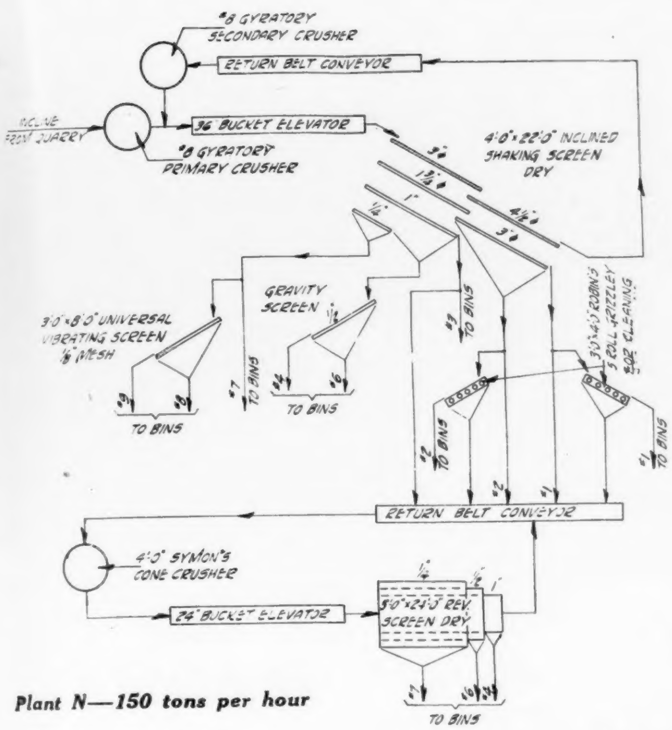
Plant G—Here the the Nos. 1 and 2 sizes are taken out in two parallel 4-ft. by 22-ft. single-jacketed revolving screens and the smaller sizes spouted to two 3-ft. by 6-ft. double-deck vibrating screens and then on to four horizontal double-deck shaking screens (two parallel rows of two in tandem), all sizing being done dry.

Plant H—This is one of the older style plants, built about 13 years ago, where all sizing is done dry in revolving screens. The No. 1 and No. 2 sizes are taken out in four parallel 4-ft. by 22-ft. single-jacketed revolving screens, followed by four parallel 4-ft. by 20-ft. revolving screens removing No. 3 size and an additional No. 2 or ballast size, followed by four parallel 4-ft. by 10-ft. revolving screens which separate the Nos. 4, 6 and 7 sizes. Arrangements are made under the bins to wash the various sizes with jets over perforated gravity screens as they are loaded into cars. Each screen is arranged with a welded plate bottom and piping so that most of the wash water is carried away.

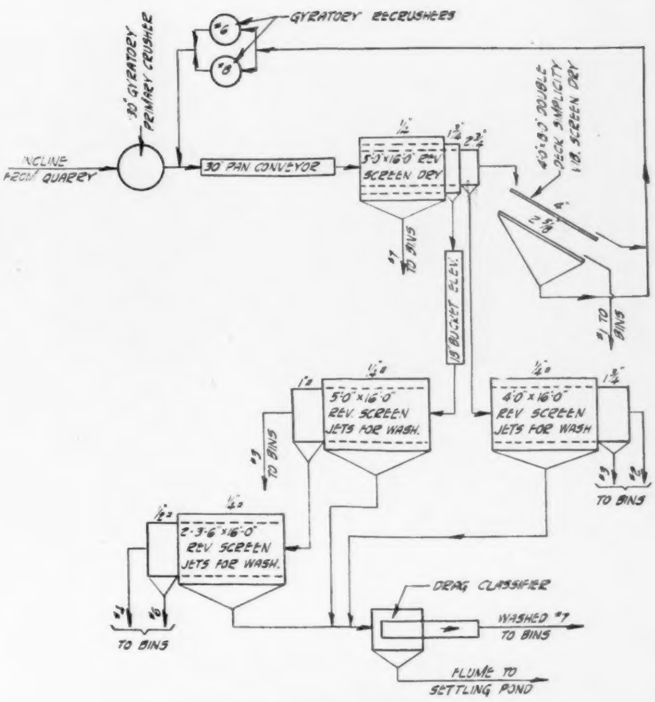
Plant I—This is another plant of about the same age to which recrushing and screening equipment has been added. A single 6-ft. by 16-ft. double-jacketed revolving screen removes the No. 1 size to bins, while the



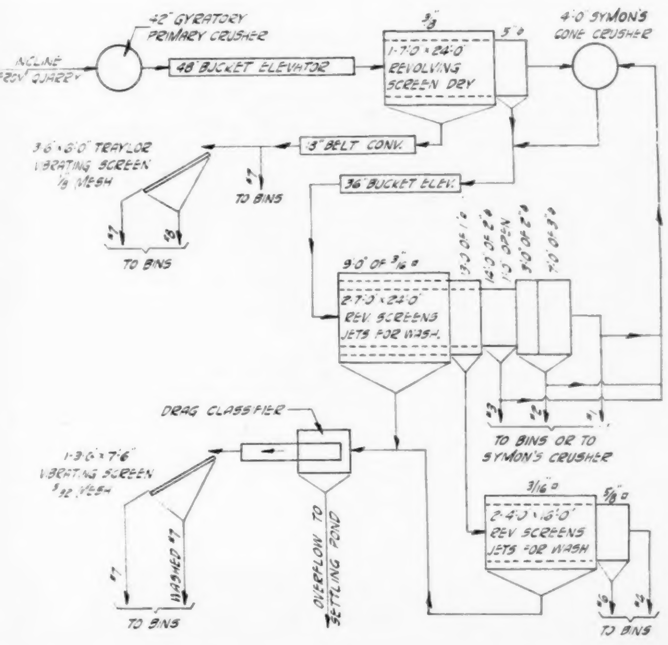
Plant M—150 tons per hour



Plant N—150 tons per hour



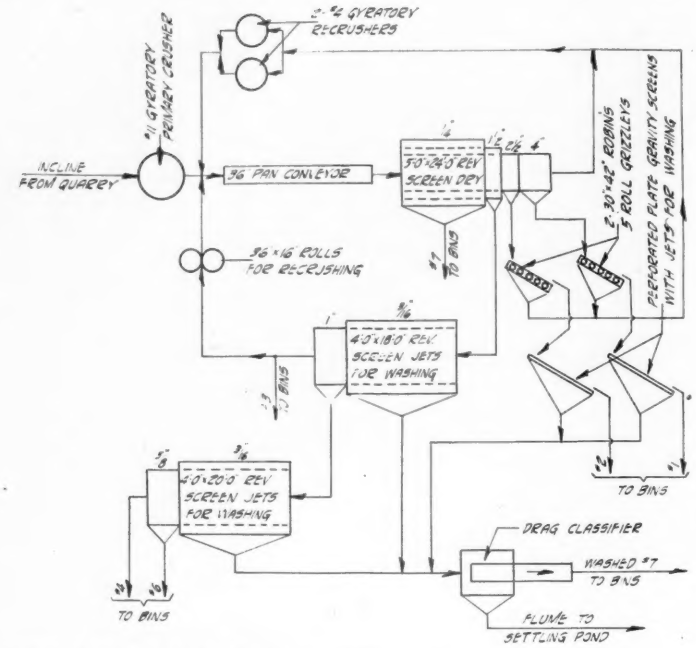
Plant O—200 tons per hour



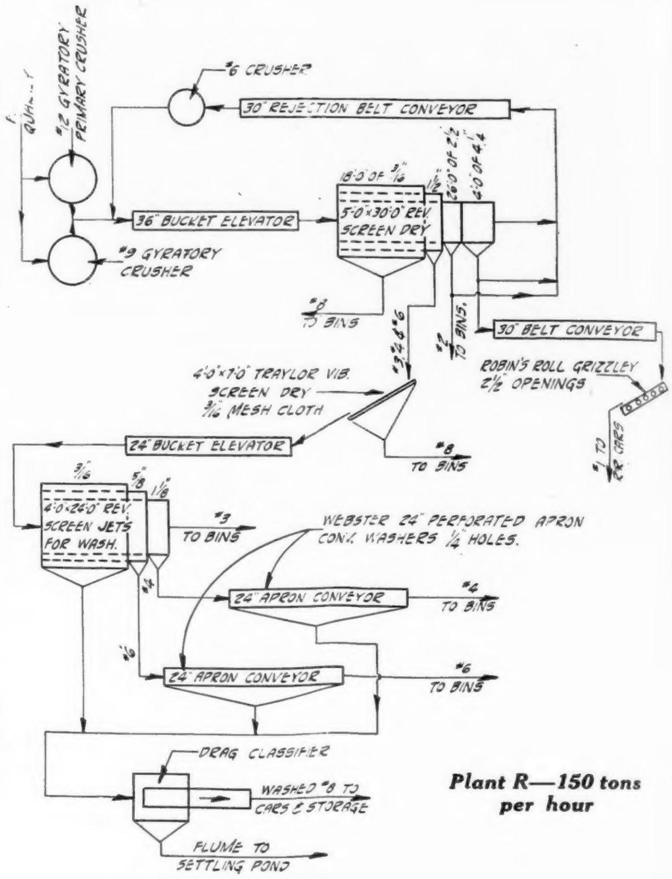
Plant P (left)—180 tons per hour.

(Right) Type of crusher used for secondary crushing

Plant P—Hook for handling large stone at primary crusher and drag classified for washed stone sand



Plant Q (above), where all sizes may be washed, and producing 150 tons per hour



Plant R—150 tons per hour

mixed Nos. 2 and 3 sizes are spouted to a 5-ft. by 24-ft. double-jacketed revolving screen below, which separates out the No. 2 and No. 3 sizes to bins, also No. 8 size, and removes for further separation any No. 4 and No. 6 material that may have carried over in the main screen. Either or both No. 2 and No. 3 sizes may be returned to a 4-ft. Symons cone crusher for recrushing. This recrushed material along with the mixed No. 4 and No. 6 sizes from the first and second screens is elevated to a third revolving screen, 5-ft. by 24-ft., double-jacketed, where No. 4, No. 6 and No. 8 sizes are separated and spouted to the bins. All of this screening is done dry, but a 4-ft. by 8-ft. Rotex screen is arranged for washing either the No. 4 or No. 6, or both.

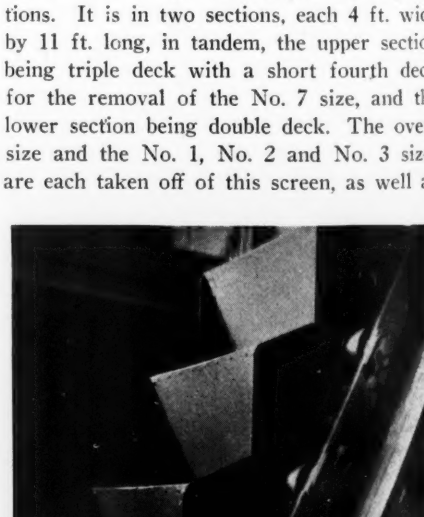
Plant J—This plant has undergone some changes and additions since it was built 14 years ago. The two original revolving screens, which were 4-ft. by 16-ft., are now used as unjacketed 6-ft. by 16-ft. screens for scalping and make a separation into two sizes; minus 1¾-in. material being conveyed to a battery of two 4-ft. by 6-ft. double-deck Niagara vibrating screens in tandem, operating dry and separating out No. 4, No. 6 and No. 7, while the No. 3 is rescreened and washed in a 4-ft. by 16-ft. single-jacketed revolving screen; and the mixed No. 1, No. 2 and No. 3 sizes being conveyed to a 3-ft. by 6-ft. roll grizzly, which removes the No. 1 size and passes the balance to a 6-ft. by 20-ft. double-jacketed revolving screen, where the No. 2 and No. 3 sizes are separated and washed and spouted to the bins. All No. 4 and No. 6 sizes from all screens may be spouted to two 3½-ft. by 11-ft. single-jacketed revolving screens, where those sizes are separated and washed.

Plant K—This is one of the plants which was built about 15 years ago and to which has been added a roll grizzly for cleaning the No. 1 size, a vibrating screen for making "agstone," and a triple-deck shaking screen for washing the No. 3, No. 4 and No. 6 sizes. The No. 1, No. 2 and No. 7 sizes are taken out in two 5-ft. by 20-ft. and two 5-ft. by 16-ft. double-jacketed revolving screens, dry, and the mixed No. 3, No. 4 and No. 6 sizes are separated and washed on two 3½-ft. by 16-ft. triple-deck shaking screens.

Plant L—In this 20-year-old plant revolving screens have been replaced by vibrating screens for all final sizing, which is done dry. The No. 1 and No. 2 sizes are taken out over two 4-ft. by 6-ft. double-deck Niagara vibrating screens, and the minus 2-in. material passing through these screens is spouted to two 4-ft. by 8-ft. double-deck Niagara vibrating screens, where the No. 3 and No. 7 sizes are taken out. The balance is spouted to two 3-ft. by 8-ft. double-deck Niagara vibrating screens which complete the separation of the No. 4 and No. 6 sizes.

Plant M—This is an old plant to which have been added three vibrating and one Rotex screen. The 6-ft. by 16-ft. primary revolving screen is double-jacketed and arranged to take out the No. 1 and No. 7 sizes, passing the mixed No. 2 and No. 3 to a double-jacketed 4-ft. by 16-ft. revolving screen, and the mixed No. 4 and No. 6 sizes to two 3-ft. by 5-ft. Robins single-deck vibrating screens for separation. The 4-ft. by 16-ft. revolving screen separates out the No. 2 and No. 3 sizes for the bins, while a 4-ft. by 12-ft. double-jacketed revolving screen separates out No. 4, No. 6 and No. 7. The arrangements are such that either or both No. 4 and No. 6 from the Robins screens or from the 4-ft. by 12-ft. revolving screen may be spouted to a 4-ft. by 8-ft. Rotex screen with jets for washing.

Plant N—This is one of the older operations, in which an original and interesting inclined shaking screen of the company's own make is used for the primary separations. It is in two sections, each 4 ft. wide by 11 ft. long, in tandem, the upper section being triple deck with a short fourth deck for the removal of the No. 7 size, and the lower section being double deck. The oversize and the No. 1, No. 2 and No. 3 sizes are each taken off of this screen, as well as



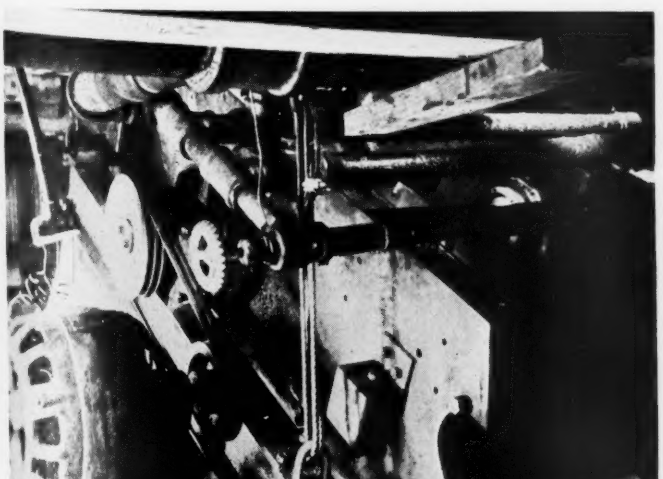
Steel bucket elevator with wheels and track for elevating crushed stone to screens

the combined No. 4 and No. 6 sizes, and the No. 7 size. The No. 1 and No. 2 sizes are each further cleaned by passing them over a 3-ft. by 4-ft. Robins 5-roll grizzly. The No. 4 and No. 6 sizes are separated over a gravity screen, and the No. 7 size is passed over a 3-ft. by 8-ft. Universal vibrating screen to make No. 8 and No. 9. The spouting arrangements permit of recrushing the No. 1, No. 2 and No. 3 sizes as required and the recrushed material is separated into No. 4, No. 6 and No. 7 sizes in a double-jacketed 5-ft. by 24-ft. revolving screen, dry. Recrushing is done in a 4-ft. Symons cone crusher.

Plant O—This is an old operation in which some changes have been made, and where all sizes except No. 1 are washed. In the primary 5-ft. by 16-ft. revolving screen, which is double-jacketed, four separations are made over and through the three barrels. No. 1 and oversize over the end is passed over a 4-ft. by 8-ft. double-deck vibrating screen, cleaning the No. 1 size and returning the balance to the recrushers. The 1¾-in. by 2¾-in. material is spouted to a single-jacketed 4-ft. by 16-ft. revolving screen where the No. 2 and some No. 3 sizes are separated and washed. The ¼-in. by 1¾-in. material is elevated to another 5-ft. by 16-ft. single-jacketed revolving screen, where some No. 3 is washed and taken out and the mixed No. 4 and No. 6 is passed on to two 3½-ft. by 16-ft. single-jacketed revolving screens for separation and further washing. The wash water containing the fines from these three washing screens flows to a drag classifier which delivers washed No. 7 size to the bins. Dry No. 7 is also available from the jacket of the primary screen.

Plant P—This is an old plant at which all sizes are washed. The material which comes from the scalping screen with the No. 7 removed is divided equally to two 7-ft. by 24-ft. jacketed revolving screens of unusual and interesting construction and arranged with jets for washing. Each screen has at the feed end an inner section 5 ft. in diam. by 14 ft. long with 2-in. round holes, and supported at its discharge end by a plate disk or partition between it and the main 7-ft. diam. screen section. The main 7-ft. diam. section is broken just back of the partition by a 1-ft. opening, as indicated on the flow sheet, and the main 7-ft. section at the feed end consists of 13 ft. of 1-in. square holes, with a 9-ft. jacket of 3/16-in. mesh wire cloth. This gives the effect of a double-jacketed screen without having the jackets unduly large and also permits of taking off four sizes, No. 1, No. 2, No. 3, No. 4 and No. 6 mixed, besides collecting most of the wash water through the jacket. The No. 4 and No. 6 sizes are separated with further washing in two parallel 4-ft. by 16-ft. revolving screens. The waste water through the jackets flows to a drag classifier, consisting of a slow moving flight conveyor, which drags the settled material from the settling box up an incline, where it is discharged to a 3-ft. by 7-ft. vibrating screen, of the company's own make, with 5/32-in. mesh wire cloth, for final screening before going to the bin as washed No. 7 or stone sand. The dry No. 7 from the scalping screen is put over a 3½-ft. by 6-ft. Traylor vibrating screen with ⅛-in. mesh cloth for making agstone.

Roll grizzly used for cleaning No. 1 and No. 2 stone as it is loaded into railroad cars



Small vibrating screen with pipes for spray washing of smaller stone

Plant Q—This is an old operation but one where all sizes may be washed. The primary 5-ft. by 24-ft., double-jacketed, revolving screen makes the following separations: oversize, No. 1, No. 2, No. 3, No. 4 and No. 6 mixed, and No. 7. The No. 1 and No. 2 sizes are each passed over a 30-in. by 42-in. Robins 5-roll grizzly for cleaning and then over gravity screens with jets for washing. The mixed No. 3, No. 4 and No. 6 sizes go to a 40-in. by 18-ft., single-jacketed, revolving screen with jets for washing, where the No. 3 is separated out to the bin and the No. 4 and No. 6 sizes passed on to a 4-ft. by 20-ft., single-jacketed, revolving screen with jets for washing, where the final separation is made. The fines from all washing screens flow to a drag classifier which delivers washed No. 7 to the bins.

Plant R—At this plant the primary 5-ft. by 30-ft., double-jacketed, revolving screen makes the following separations: oversize, No. 1, No. 2, No. 3, No. 4 and No. 6 mixed, and No. 8. The No. 1 size is further cleaned over a Robins roll grizzly at the railroad loading point. The mixed No. 3, No. 4 and No. 6 sizes are passed over a 4-ft. by 7-ft. Traylor vibrating screen for cleaning and are sized in a 4-ft. by 24-ft., double-jacketed, revolving screen with jets for washing. Further washing of the No. 4 and No. 6 sizes is done on perforated, steel pan conveyors with ¾-in. holes and jets, these conveyors serving the double purpose of washing and conveying the material to the bins. The wash water from these and from the 4-ft. by 24-ft. revolving screen flows to a settling box and inclined drag conveyor, which takes out washed No. 8 to the cars or storage, in the same manner as at Plants O, P, and Q.

The above brief descriptions of the screening arrangements of a number of the plants show the wide difference in detail arrangement. However, with a few exceptions, the same general scheme is used; namely, to take out the oversize and usually the No. 1 size, or the No. 1 and No. 2 sizes as the first step, and then the No. 3, or the No. 2 and No. 3, as a second step, and the No. 4 and No. 6 as a last step, where revolving screens are used.

At five of the plants where washing is done the wash water from the jackets of the revolving screens is flumed to a settling box and drag classifier where the minus ¼-in. material is reclaimed as washed stone sand. At all washing plants, waste water flows to a settling reservoir and is reused.

Conclusions

In conclusion, the trend seems distinctly to be toward the use of the vibrating type inclined screen for sizing, as well as scalping, and the washing of most if not all sizes.

The extensive use of the vibrating screen is not surprising when it is considered that its first cost is less than other types, that it is operated with a 3-hp. or 5-hp. motor as against a 15-hp. or 20-hp. or larger motor, and that it requires much less space, and does very effective work.

Sales of Lime in 1930

THE SALES of lime by producers in the United States in 1930 amounted to 3,384,000 short tons valued at $24,950,000 according to estimates furnished by lime manufacturers to the United States Bureau of Mines, Department of Commerce. This is a decrease of 21% in quantity and 25% in value as compared with sales of 4,269,768 tons valued at $33,478,848 in 1929. The estimated sales of hydrated lime, which are included in these figures, amounted to 1,306,000 tons in 1930 valued at $10,102,000, a decrease of 16% in quantity and 21% in value from the production of 1,550,771 tons valued at $12,771,525 in 1929. The average unit value of all lime showed a decrease from $7.84 a ton in 1929 to $7.37 in 1930.

Smaller demand and unsettled conditions were generally reported in the lime industry in 1930. Lime for construction was apparently more adversely affected than other classes of lime. The demand for lime for chemical uses was also slow, although there were some individual reports of better demand than for 1929. Lime for agricultural use was reported in especially good demand during the spring of 1930, but continued drought and consequent crop failures greatly curtailed later requirements in many sections of the country. Sales of lime in 1930 for construction are estimated at 1,200,000 tons compared with 1,640,827 tons in 1929, a decrease of 27%. Sales of lime for chemical uses are estimated at 1,900,000 tons compared with 2,290,612 tons in 1929, a decrease of 17%. Included in the estimated sales of chemical lime in 1930 are sales of refractory lime (sintered dolomite) amounting to 356,000 tons, a decrease of 27% from the output reported for 1929. The sales of lime for agricultural use are estimated at 284,000 tons, a decrease of 17% from the 338,329 tons reported in 1929.

The principal states producing lime in 1930 showed decreases from the 1929 production ranging from 4% to 46% in quantity and 9% to 44% in value. A few of the states whose output is limited to one or two producers showed small increases in sales. As in 1929 the leading state in production of lime was Ohio with an estimated output in 1930 of 742,000 short tons valued at $5,614,000, a decrease of 23% in quantity and 29% in value from 1929. Over 60% of the sales of lime from this state is usually for construction, a little over 35% for chemical use, and less than 5% for agriculture. Ohio is also the largest producer of hydrated lime, the greater part of which is used for construction. The estimated sales of hydrated lime in Ohio in 1930 were 473,000 tons valued at $3,390,000, a decrease of 23% in quantity and 31% in value from 1929. Pennsylvania ranked next to Ohio in the annual production of lime with an estimated output of 617,000 tons valued at $4,468,000 in 1930. This represents a decrease of 21% in quantity and 24% in value from 1929. Pennsylvania also ranked second among the states in production of building lime, but its output is less than one-third that of Ohio. The Keystone State produces more agricultural lime than any other state, but the greater part of its output—nearly 60%—is chemical lime. It ranked second in production of hydrated lime, sold chiefly for agriculture. The sales of hydrated lime in Pennsylvania in 1930 were estimated at 225,000 short tons and represented a decerase of 13% in comparison with the preceding year.

The most notable decrease (46%) in the volume of production occurred in Wisconsin. The lime from this state is shipped largely to Illinois and sold for construction purposes. Other states producing chiefly building lime and showing considerable decreases in output in comparison with 1929 were Connecticut, Maine, Massachusetts, and Texas.

The accompanying table compares the estimated sales of lime in 1930, by states, with similar figures for 1929.

LIME SOLD BY THE PRODUCERS IN THE UNITED STATES IN 1929 AND 1930

	1929			1930 (estimated)		
	Total lime		Hydrated lime	Total lime		Hydrated lime
	Short tons	Value	(short tons)	Short tons	Value	(short tons)
Ohio	962,415	$ 7,935,656	615,072	742,000	$ 5,614,000	473,000
Pennsylvania	782,915	5,896,752	259,251	617,000	4,468,000	225,000
Missouri	316,579	2,319,886	107,759	261,000	1,813,000	98,000
West Virginia	308,600	1,865,531	51,426	223,000	1,328,000	40,000
Alabama	209,260	1,223,623	40,688	174,000	937,000	26,000
Tennessee	172,936	1,036,405	41,021	153,000	854,000	43,000
Virginia	153,170	1,061,018	53,330	144,000	947,000	65,000
Massachusetts	133,644	1,443,984	16,731	104,000	926,000	16,000
Indiana	116,795	786,814	50,004	89,000	585,000	37,000
Michigan	91,468	844,543	17,527	88,000	688,000	15,000
Illinois	119,382	973,312	33,659	87,000	736,000	32,000
New York	104,614	906,021	46,665	86,000	710,000	37,000
Texas	97,332	838,470	40,149	73,000	626,000	33,000
Wisconsin	130,902	1,094,388	11,668	71,000	642,000	12,000
Maine	92,428	772,443	(1)	65,000	482,000	(1)
Vermont	53,128	505,246	10,423	48,000	437,000	10,000
Maryland	54,029	404,674	35,869	46,000	366,000	33,000
California	49,753	526,391	12,305	45,000	455,000	14,000
Utah	46,581	365,055	(1)	35,000	264,000	(1)
Arizona	42,971	397,308	(1)	35,000	332,000	(1)
Arkansas	33,647	295 816	(1)	31,000	254,000	(1)
Connecticut	35,180	386,855	(1)	25,000	215,000	(1)
Washington	31,598	324,683	(1)	22,000	224,000	(1)
Undistributed	130,441	1,273,974	107,224	120,000	1,047,000	97,000
	4,269,768	$33,478,848	1,550,771	3,384,000	$24,950,000	1,306,000

*Included under "Undistributed."

Bulletin on Industrial Research

THE FOURTH EDITION of Industrial Research Laboratories of the United States has just been issued as Bulletin No. 81 by the National Research Council, Washington, D. C.

The new edition has been revised and enlarged and contains an alphabetical list of about 1625 laboratories, a list of more than 1900 directors of research, a geographical index and a subject index. The price is $2.

Fred R. Patterson Is Made General Manager of Firm

ACCORDING to an announcement issued a few days ago by the National Lime and Stone Co. of Findlay, Ohio, Fred R. Patterson of Findlay and formerly of Lewisburg has been elected vice-president and general manager. Mr. Patterson left Lewisburg seven years ago when he was transferred to the home offices to assume the position of general superintendent, in charge of the stone division of the company. He came to Lewisburg three years previous from Lafayette, Ind., where he had been in charge of a gravel plant.

He has been identified with the stone industry all his life, starting in when only a lad with his father, Joseph Patterson, and uncle, Allen Patterson.—*Lewisburg* (Ohio) *Ledger*.

Directory of Rock Products Producers in France

THE 1930-31 ISSUE of the Annuaire des Carrieres de France has just been published by the Mines Carrieres, 109-119 Boulevard Lefebvre, Paris.

This directory and review of the quarrying industry of France, consisting of some 450 pages, is in three main divisions.

The first division giving a list of societies and associations connected with the industry, is followed by a general survey, geological charts, and several pages of technical data.

The second division lists the principal producers according to states or political divisions of France.

A third division is given over to advertisement of manufacturers of equipment.

Rates and Rate Making*

Things Producers of Aggregates Should Know About the Transportation Characteristics of Their Commodities

By Edwin C. Brooker
Commerce Counsel, Washington, D. C.

THE SUBJECT of "Rates and Rate Making," particularly as it applies to crushed stone and related commodities, is one of great importance to the producers and consumers of such commodities.

The producers as a rule do not pay the freight charges on crushed stone, but are interested to the extent of having freight rates which will enable the commodity to move to the respective markets at just and reasonable rates and at rates which are relatively aligned with rates from competing points of origin, as ofttimes reductions in selling prices are necessary to equalize delivered costs at destination.

It is the duty of shippers of crushed stone to see that the consumers do not have to pay more than just and reasonable rates and to that end, should cooperate to see that proper levels are established and applied.

Crushed stone represents an article of commerce which is a very desirable commodity from a transportation viewpoint as I shall attempt to show.

In making rates on any traffic there are certain fundamental transportation factors which must be taken into consideration. These are as follows: (1) Nature and value of the commodity as it affects carriers' risk in handling and what the traffic will bear. (2) Susceptibility to loss or damage in transit as it affects carriers' risk and liability in handling. (3) Average loading of the commodity. (4) Volume of the traffic.

These are the main factors to be considered in the question of just and reasonable rates. There are others of incidental importance which I will not discuss in detail.

Crushed stone is representative of a group of commodities which includes sand, gravel, slag, etc. It is one of the lowest valued commodities offered to the carriers for transportation and cannot move except at low rates, because freight rates in numerous cases exceed the value of the commodity f.o.b. shipping point.

Crushed stone is transported almost exclusively in open-top cars and not subject to damage in transit by any of the elements or by rough handling and the only claims for loss occur in the case of defective equipment or in case of wreck. Claims for loss or damage on crushed stone and related commodities are so negligible that they have not even been given a separate classification in the claim records of the railroads.

From the standpoint of value, therefore, as it affects risk and liability in transportation and carriers' costs of handling, it is a very desirable traffic.

Another important factor is that it is a heavy loading commodity, the average being in excess of the marked capacity of the car and generally exceeding 55 tons per car. While rates on crushed stone are generally on a per ton basis, yet the car is the unit of transportation.

The car is the unit of all switching and terminal movements whether empty or loaded. It is the unit for all billing and accounting records. It is the unit on which interest on investment, taxes, depreciation, repairs and per diem charges are computed and allocated to carriers' costs.

How the Railways Estimate Costs

If all of these costs are allocated to a car of crushed stone for the time it is in such service for an individual movement and distributed among 55 tons, it is very apparent that the cost per ton is much lower than on lighter loading commodities.

In making up a train, the tare weights of a car as compared with the net weight of the loaded commodity is also an important item. Each locomotive is rated to haul a certain number of tons over the different divisions of a railroad on which it is used.

Take for example an engine with a rating of 1500 tons. It can handle 20 carloads of crushed stone, consisting of 1100 tons of revenue paying freight and only 400 tons of dead weight, representing the tare weight of the cars, at an average of 20 tons per car. To make up a trainload of a commodity averaging only 20 tons per car, it would require 37.5 or 38 cars, of which there would be only 750 tons of revenue freight and 750 tons of dead weight.

Compare the use of 20 cars in a train of crushed stone with the use of 38 cars in connection with the handling of a commodity with an average loading of 20 tons.

Compare a distribution of train costs to 1100 tons of crushed stone with only 750 tons of a commodity loading 20 tons to make up a train load.

Similar comparisons which reflect a relatively low tare weight per car as compared with the load can also be made.

When it comes to allocating the costs for switching, terminal and weighing services, for billing and maintaining accounting records, for repairs, per diem, depreciation of equipment, taxes, interest on investment, etc., you will find these costs are the same on a car whether loaded with crushed stone or loaded with a lighter loading commodity. The average cost per ton on a car loaded with 55 tons of crushed stone, must, therefore, be lower than on a car loaded with only 20 tons of some other commodity.

The weight loaded into a car is an important factor in reducing the handling costs per ton and crushed stone being one of the heaviest loading commodities transported by the railroads, is entitled to the lowest rates per ton from an average loading standpoint.

Volume of Business from Individual Plants a Factor

The volume of movement from individual plants is also an important factor.

Picture the switching and terminal service at a plant where 10, 15 or 20 cars are placed and loaded daily, compared with like service at an industry using but one or two cars per day. Those who are actually engaged around the plants know that the service of placing or picking up five or more cars in a single movement is no greater than where the service is performed on one or two cars.

The costs of handling crushed stone per car because of the volume of movement, must be lower than on traffic represented by commodities of less volume.

We have lower costs per car because of volume, followed by lower costs per ton because of heavy loading, on a commodity of extremely low value, in connection with which the carriers have no risk or assume no liability in handling.

Crushed stone requires no special or

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expedited service. It provides a quick turnover of equipment because of methods used in loading and unloading and in numerous cases utilizes equipment which otherwise would move empty in the direction of coal mines.

Taking these transportation conditions into consideration, and the same would apply to sand, gravel and slag, we have in crushed stone a very desirable traffic and one which is entitled to relatively low rates per ton.

The situation as it exists can best be expressed by a statement of a railroad superintendent some years back when he said that he would rather have a crushed stone or sand and gravel plant on his railroad than several other smaller industries shipping higher grade traffic.

This is because crushed stone, etc., requires a lesser service at lower costs in proportion to the revenue received than on other traffic.

Comparisons with Other Classes of Traffic

Sixth class traffic at a rate of 15c per 100 lb. or $3 per ton for a distance of 100 miles only pays the railroads minimum revenues of $60 per car for both single and joint line movements, whereas crushed stone and sand and gravel in the Southwest, Southeast and in some parts of the Eastern District, will provide revenues of $55 per car for the same distance at a rate of $1 per ton for single line hauls and greater revenues for joint line hauls.

It can, therefore, be readily seen that with approximately the same revenues per car as on sixth class traffic and the lower relative costs per car on crushed stone, that the latter commodity returns a greater revenue per car and is a very desirable traffic at the present rate levels.

This information should be stressed by shippers in their negotiations with the carriers and in all proceedings, where the rates on crushed stone and related commodities are involved, in order to dispel the oft-expressed idea that it is not a desirable traffic from a revenue producing standpoint.

I have always been a staunch advocate that shippers are entitled to just and reasonable rates and at the same time have never advocated any proposition which I considered unfair from a carrier's standpoint.

Establishment of "Rate Levels"

In addition to considering the transportation factors I have mentioned, it is customary in individual instances to consider the general level of rates, in the same or contiguous territory on the same or like commodities, as a guide for a reasonable level of rates. Comparisons are also made with rates on the same or like commodities in other parts of the same district or territory or with rates in other territories.

The tendency today, as it has been in the past few years, is towards the establishment of rate levels on crushed stone and related commodities on a uniform basis.

Except in a few spotted sections of the United States where competitive point-to-point rates have been established or prescribed, such as between Indiana and Illinois, and from such territory to Michigan points, the general tendency is to establish maximum mileage scales to be used as a guide in the publishing of rates.

Thus in Southeastern territory, which includes the territory east of the Mississippi River and south of the Ohio and Potomac Rivers, there has been prescribed a general maximum scale of rates on sand, gravel, crushed stone, slag and related commodities.

In Southwestern territory similar action has been taken.

In the Western States we have maximum mileage scales laid down as precedents in the Clay County Crushed Rock Co. and the McGrath Sand and Gravel Co. cases, which set the general basis for that territory.

In the Eastern district we have a hodge-podge adjustment commencing with the Buckland scale in the Atlantic Seaboard territory, the West Penn scale on a slightly lower basis in the Pittsburgh area, and lower rates either on a mileage or specific point to point basis west thereof.

There has been in the Eastern district no co-operation or unity of action among shippers of crushed stone, sand, gravel or slag, either as between shippers in any one individual group or as between all shippers of these commodities as a whole. It is in the territory of Pittsburgh and East, where the rates have always been on an exceedingly high level, that the greatest difficulty has occurred in having a reasonable basis established.

Far-Reaching Effect of the "Penn Scale"

There is not a shipper in this room who has been involved in rate litigation in recent years who has not been confronted with the level of the Pennsylvania sand and gravel scale, sometimes called the Penn scale, and which I refer to as the West Penn or Docket 15329 scale.

That particular scale when prescribed, had the effect of reducing the carriers' revenues in the territory involved approximately $700,000 per year. This is referred to, merely to show you the extent of the reductions involved in that territory.

It was considered a big victory by shippers when that scale was prescribed in that territory and yet I must apologize to shippers everywhere for the handling of that litigation.

Following the establishment of the West Penn scale, slag interests in Trunk Line territory east of Harrisburg, Penn., were involved in proceedings which netted then a higher scale known as the Buckland scale, and which I claim was prescribed either based on erroneous or insufficient evidence or else a mistaken idea of the actual application of the West Penn scale.

I am now engaged in handling a general slag case and also a sand and gravel case from one shipping point in that territory in which I am hopeful of wiping the Buckland scale out of existence.

Remember, the Eastern district is a territory where precedents have been established on other traffic, making it the lowest rated territory of any in the United States, because it has always been a precedent that rates in the West, Southwest and Southeast should be on a higher basis than in the Eastern district.

The West Penn scale stands out as a barrier to the securing of a lower level of rates east thereof in the two cases I am now handling in that territory and the Commission is disposed to look upon it as a Central territory scale.

As long as that scale remains unchallenged before the Interstate Commerce Commission, it will act as a barrier to the proper relief in the Eastern district and it will likewise affect in future litigation, as it has in the past, the securing of a proper level of rates in other territories. That explains the reason for my apology, irrespective of the feeling of the shippers in that territory, that results secured were more than satisfactory.

Another Key Case

The Commission in the McGrath case —165 I. C. C. 461 said:

> From the standpoint of what we believe to be relative transportation conditions, there has undoubtedly been an inconsistency between our decisions with respect to rates on sand and gravel in Southern and Southwestern territories and our decisions with respect to corresponding rates in official territory.

The Commission prescribed a higher scale in the McGrath case than in the Southwest.

The point I wish to stress is this: That shippers in the same or other territories are interested either directly or indirectly in all complaints or investigations involving rates on crushed stone, sand or gravel or slag, and shippers directly involved owe it as a duty to other shippers in the same or other territories, to do everything possible to see that just and reasonable rates are prescribed as a result of such litigation, and no precedents are established which will be injurious to other interests.

It is customary to compare the relative rates, revenues and transportation factors on crushed stone, for example, with rates, revenues and transportation characteristics on other commodities.

I respectfully assert that crushed stone and related commodities generally are paying more than their proper share of the revenues of the carriers in proportion to costs of handling. There are none of us who object to the carriers receiving reasonable revenues on commodities such as crushed stone, etc., because it is necessary to efficient and effective transportation, but there should be a proper distribution of transportation costs among the various kinds of traffic.

Gradual Revision in Progress

The general rate structure of the country is gradually undergoing a general revision and in such revisions, reductions in carriers' revenues occur. In this general revision, shippers of crushed stone and related commodities must see that their traffic is placed or continued on a proper rate level as compared with other commodities.

The Commission is pursuing an investigation at the present time of rates on so-called "Industrial Sands" with the idea of arriving at a classification of sands for rate-making purposes and establishing a rate level thereon. This covers the Eastern district.

The railroads have announced at that hearing that effective on or about February 15 next, tariffs will be issued which will restrict the application of present rates on gravel, slag, crushed stone and screenings, ground limestone, agricultural limestone, fluxing limestone, dolomite, etc., to shipments in open-top cars and will also establish a basis of 60% of Sixth Class rates on shipments in box cars.

This action only covers Central territory at present, but if allowed to go into effect will in the course of time affect other territories.

Sixty per cent of Sixth Class rates at 100 miles means a rate of $1.80 per ton on box-car shipments of these commodities as compared with only $1 under the West Penn scale on the same commodities in open-top cars.

The danger of this proposal, and it applies whether you ship any of these materials or not, is that the difference in rates between open-top and box-car movements is so great, 80c per ton in the instance mentioned, that if unchallenged and permitted to go into effect, will eventually lead to an increase in open-top car rates, as there is no justification for the differences contemplated and box-car rates will be pointed to as a reason for such increases.

This information is given to you that you may know what is transpiring, and to raise a thought in your minds of the necessity of each association establishing a transportation committee, consisting of shippers in each territory to consider and deliberate on matters of this kind and keep informed as to contemplated changes and litigation instituted in all parts of the country and take whatever action may be necessary to protect the Association members as a whole.

There are other matters, such as competition and joint line rates which I have not discussed due to lack of time assigned.

Sales of Slate in 1930

THE SLATE SOLD at the quarries of the United States in 1930 was approximately 450,000 short tons, valued at $7,550,000, according to estimates furnished by producers to the United States Bureau of Mines, Department of Commerce. This was a decrease of 33% in both quantity and value from the output reported for 1929, which was 670,070 short tons valued at $11,245,178.

The roofing slate sold in 1930, estimated at 323,000 squares and valued at $3,200,000, decreased 30% in quantity and 35% in value from 1929. The drop in value represents a decrease of 74c in the average value per square. The decrease in quantity was largest in the New York-Vermont district where the estimated sales in 1930 amounted to 101,000 squares valued at $1,316,000, a decrease of 39% in quantity in comparison with the preceding year. The sales of roofing slate in Pennsylvania were estimated at 190,000 squares valued at $1,422,000, a decrease of 25% in quantity.

The total sales of mill stock in 1930, estimated at 7,525,000 sq. ft., valued at $2,609,400, decreased 24% in quantity and 29.5% in value in comparison with 1929. Mill stock for structural slate—2,104,000 sq. ft. valued at $824,000, decreased 36% in both quantity and value. Electrical slate, 1,002,000 sq. ft. valued at $738,000, decreased 31% in quantity and 36% in value. Slate for school slates, 1,727,000 pieces (890,000 sq. ft.) valued at $19,000, decreased 6% in quantity and 7% in value. Mill stock for blackboards and bulletin boards, 3,020,000 sq. ft., valued at $885,000, decreased 15% in both quantity and value in 1930. Slate for billiard-table tops, 146,000 sq. ft., valued at $58,000, decreased 10% in quantity and 11% in value. Slate for vaults and covers, 363,000 sq. ft., valued at $85,400, decreased 30% in quantity and 36% in value.

Slate sold for flagging, cross-walks, stepping-stones, etc., was estimated at 851,000 sq. ft., valued at $100,000 in 1930, a decrease of 32% in quantity and of 19% in value compared with 1929.

The sales of crushed slate for roofing granules and flour in 1930 was estimated at 282,000 short tons, valued at $1,640,000. In comparison with 1929, this represents a decrease of 34% in both quantity and value.

The accompanying table compares the estimated sales of slate by quarrymen in 1930, by uses, with the sales in 1929.

Standard Gypsum Company to Erect New Plaster Mill

IT IS REPORTED that plans are now being prepared in the east for a new gypsum plaster mill which the Standard Gypsum Co. of Canada, Ltd., proposes to erect somewhere on the Vancouver waterfront. Directors of the firm, it is said, are now considering two possible sites both adjacent to water in order to facilitate the receipt of raw materials. The proposed mill will, it is understood, involve an outlay of some $100,000. The plant will produce finishing, casting and hard wall plaster manufactured from gypsum rock.

ROOFING SLATE, MILL STOCK,* AND SLATE GRANULES SOLD IN UNITED STATES IN 1929 AND 1930, BY USES

	1929		1930 (estimated)	
	Quantity	Value†	Quantity	Value†
Roofing, squares	462,120	$4,920,766	323,000	$3,200,000
Approximate equivalent in short tons	178,500		124,000	
Electrical, square feet	1,461,110	1,153,396	1,002,000	738,000
Approximate equivalent in short tons	12,580		8,600	
Structural and sanitary, square feet	3,286,550	1,287,150	2,104,000	824,000
Approximate equivalent in short tons	24,730		16,000	
Grave vaults and covers, square feet	515,450	133,031	363,000	85,400
Approximate equivalent in short tons	4,700		3,320	
Blackboards and bulletin boards, square feet	3,562,360	1,042,771	3,020,000	885,000
Approximate equivalent in short tons	9,280		7,900	
Billiard-table tops, square feet	161,470	65,426	146,000	58,000
Approximate equivalent in short tons	1,390		1,260	
School slates, pieces	1,843,000	20,371	1,727,000	19,000
Aproximate equivalent in square feet	949,540		890,000	
Approximate equivalent in short tons	1,030		970	
Flagstones, walkways, etc., square feet	1,248,190	124,524	851,000	100,600
Approximate equivalent in short tons	8,920		5,950	
Granules, short tons	428,940	2,497,743	282,000	1,640,000
Total (quantities approximate, in short tons)	670,070	$11,245,178	450,000	$7,550,000

*In 1929 the mill stock sold, including school slates, was 9,936,480 sq. ft., valued at $3,702,145; in 1930, 7,525,000 sq. ft., valued at $2,609,400.

†F.o.b. at point of shipment.

Researches on the Rotary Kiln in Cement Manufacture†

Part XII—The Specific Heats of the Gases of Combustion at High Temperatures

By Geoffrey Martin

D.Sc. (London and Bristol), Ph.D., F.I.C., F.C.S., M. Inst. Chem. Eng., M. Inst. Struct. Eng., M. Soc. Pub. Analysts, F. Inst. Fuels; Chemical Engineer and Consultant; Former Director of Research of the British Portland Cement Research Association; Author of "Chemical Engineering"

THE MAIN HEATING AGENT in the upper part of the kiln is the hot furnace gases evolved by the combustion of the coal dust; these gases, as previously calculated in Part VII, have the approximate composition by weight:

$CO_2 = 23.267$; $N = 67.996$; $HO_2 = 3.973$; excess air $= 4.764$.

It is of vital importance for the theory of the rotary kiln to ascertain the specific heat of this mixture at various temperatures so as to be able to ascertain how much heat can be obtained from a given weight of this gas when it sinks through different temperature intervals as it passes down the kiln.

The author has worked out tables of the values of the *instantaneous* and *mean specific heats* at high and low temperatures of the individual gases which occur in the cement rotary kiln, these values being calculated from recent modern researches, and, consequently, they exceed in accuracy any data previously available in the cement industry. Table I shows these values.

The weight of *combustion gas* produced by the burning of 1 lb. of standard coal was proved in Part III to be 11.278 lb., composed of 2.624 lb. of CO_2; 7.669 lb. of N; 0.448 lb. of H_2O, and 0.537 lb. of excess air.

The instantaneous or true specific heat S of this gaseous mixture may be calculated at the various temperatures from the formula:

$$S_t = \frac{2.624 \times S_1 + 7.669 \times S_2 + 0.448 \times S_3 + 0.537 \times S_4}{11.278} \qquad (1)$$

where S_1, S_2, S_3, S_4 are the respective instantaneous specific heats of the CO_2 N, H_2O, or air at the temperature at which it is desired to ascertain the instantaneous specific heat of the mixture.

For example, the instantaneous *specific heat of the combustion* gas at 4000 deg. F. is obtained by substituting in the above formula the values of the *instantaneous specific* heats of the various component gases at 4000 deg. F., as shown in Table I below.

We thus get:

Instantaneous specific heat of combustion gas at 4000 deg. F.

$$= \frac{2.624 \times 0.32 + 7.669 \times 0.32 + 0.448 \times 0.98 + 0.537 \times 0.31}{11.276}$$

$$= 0.3457.$$

TABLE II—SPECIFIC HEATS OF COMBUSTION GAS OF A CEMENT ROTARY KILN AT VARIOUS TEMPERATURES

Composition of combustion gas by weight $\begin{cases} CO_2 = 23.267\%;\ N = 67.996\%; \\ H_2O = 3.973\%;\ \text{excess air} = 4.764. \end{cases}$

Temperature, deg. T. deg. F.	deg. C.	Instantaneous specific heat	Mean specific heat between 1481 deg. F. (805 deg. C.) and T. deg.
5000	2760	0.3774	0.3286
4900	2704	0.3742	0.3270
4800	2649	0.3708	0.3253
4700	2593	0.3676	0.3237
4600	2538	0.3642	0.3220
4500	2482	0.3610	0.3204
4400	2427	0.3580	0.3189
4300	2371	0.3548	0.3173
4200	2316	0.3518	0.3158
4100	2260	0.3486	0.3142
4000	2204	0.3457	0.3128
3900	2149	0.3426	0.3112
3800	2093	0.3398	0.3098
3735	2057	0.3379	0.3089
3700	2038	0.3369	0.3084
3600	1982	0.3340	0.3069
3500	1926.5	0.3310	0.3054
3400	1872	0.3283	0.3041
3300	1816	0.3256	0.3027
3200	1760	0.3228	0.3013
3100	1704	0.3201	0.3000
3000	1649	0.3174	0.2986
2900	1594	0.3149	0.2974
2800	1538	0.3123	0.2961
2700	1482	0.3098	0.2948
2600	1427	0.3071	0.2935
2590	1421	0.3068	0.2933
2580	1415	0.3066	0.2932
2570	1410	0.3063	0.2931
2560	1404	0.3061	0.2930
2550	1399	0.3058	0.2928
2540	1393	0.3056	0.2927
2530	1388	0.3053	0.2926
2520	1382	0.3051	0.2925
2510	1377	0.3048	0.2923
2500	1371	0.3046	0.2922
2490	1365	0.3044	0.2921
2480	1360	0.3041	0.2920
2470	1354	0.3039	0.2919
2460	1349	0.3036	0.2917
2450	1343	0.3034	0.2916
2440	1337	0.3032	0.2915
2430	1332	0.3029	0.2914
2420	1327	0.3027	0.2913
2410	1321	0.3024	0.2911
2400	1315	0.3022	0.2910
2300	1260	0.2998	0.2898
2200	1204	0.2975	0.2887
2100	1149	0.2952	0.2875
2000	1093	0.2928	0.2863
1900	1038	0.2003	0.2851
1800	982	0.2878	0.2838
1700	926	0.2854	0.2826
1600	871	0.2830	0.2814
1500	815	0.2804	0.2801
1481	805	0.2799	0.2799
1400	760	0.2777	0.2788
1300	704	0.2749	0.2774
1200	649	0.2720	0.2759
1100	594	0.2692	0.2745
1000	548	0.2664	0.2731
900	483	0.2634	0.2716
800	427	0.2604	0.2701
700	371	0.2574	0.2681
600	315	0.2544	0.2671
500	260	0.2513	0.2656
400	204	0.2482	0.2640
300	149	0.2450	0.2624
212	100	0.2421	0.2610
200	93	0.2417	0.2608
100	38	0.2384	0.2591
60	16	0.2370	0.2584
32	0	0.2361	0.2580

Proceeding in this way, the values of the *instantaneous specific heat* of the combustion gas, shown in column 2 of Table II above, were obtained partly by calculation and partly by interpolation from a large-scale curve drawn through various calculated points.

A temperature of pivotal importance in the theory of the rotary kiln is 1481 deg. F. (805 deg. C.), because this is the temperature at which the calcium carbonate begins to decompose under the prevailing composition of the gaseous atmosphere inside the kiln arising from the combustion of the coal.

As will be seen in the next chapter, it is of great importance in the theory of the

TABLE I—INSTANTANEOUS SPECIFIC HEATS OF THE INDIVIDUAL GASEOUS COMPONENTS OF COMBUSTION GASES

Gas	Composition of combustion gases	Instantaneous specific heat at (deg. F.) 4000	3500	3000	2500	2000	1500	1000	800	500	200	30
CO_2	2.624 lb.	0.32	0.31	0.308	0.303	0.299	0.286	0.2652	0.2545	0.2359	0.2144	0.2010
N_2	7.669 lb.	0.32	0.31	0.298	0.287	0.276	0.266	0.2554	0.2512	0.2449	0.2385	0.2350
H_2O	0.448 lb.	0.98	0.85	0.740	0.648	0.574	0.520	0.4843	0.4721	0.4678	0.4670	0.4695
Excess air	0.537 lb.	0.31	0.30	0.288	0.278	0.268	0.258	0.2479	0.2439	0.2379	0.2319	0.2285
	11.278 lb.											

rotary kiln to know the mean *specific heat* of the combustion gases *between* 1481 deg. F. (805 deg. C.) and various temperatures both above and below 1481 deg. F. This is calculated as follows:

From the formula given above, the *instantaneous specific heat* of the combustion gas at 1481 deg. F. is calculated to be 0.2799. The instantaneous specific heat of the combustion gases at any *given temperature* T deg. is likewise calculated to be, say, S_T. Then a *straight line law* is assumed to connect these two values (which is *nearly* true), and the formula for the *mean specific heat* S between 1481 deg. and T deg. F. is:

$$S = \frac{0.2799 + S_T}{2} \quad . \ . \ . \ (2)$$

Proceeding in this way, column 3 of Table II was calculated, which gives the mean specific heats up to 5000 deg. F, on the assumption, of course, that the furnace gases remain undecomposed at these temperatures.

One pound of *standard coal* of 12,600 B.t.u per pound evolves 11.278 lb. of this gas consisting of CO_2 = 2.624 lb.; N = 7.669 lb.; H_2O = 0.448 lb.; excess air = 0.537 lb.

(To be continued)

Sherman Anti-Trust Law to Be Enforced

THE Department of Justice announces that suit in equity has been filed in the southern district of New York against the Asphalt Shingle and Roofing Institute and other companies and individuals connected with the institute, alleging violation of the anti-trust laws.

The action is brought to prevent further alleged restraint of interstate trade and commerce contrary to the Sherman anti-trust law, together with acts amendatory thereof and supplemental thereto.

The defendant institute is a "current price" trade association whose membership is composed of all the defendant manufacturers. Its activity pertains chiefly to the business carried on by the defendant manufacturers in non-patented asphalt shingle and roofing products and allied lines. The total output of such products of these manufacturers constitutes a major portion of the nation's supply.

Previous Competition Cited

The defendant manufacturers, the petition alleges, have sold and delivered said products and have caused the shipments by rail or otherwise, across state boundaries, and the delivery thereof to purchasers in distant states and have thus been carrying on trade and commerce among the several states of the United States within the meaning of the Sherman anti-trust act. Prior to the formation of the combination, the defendant manufacturers were in competition.

The petition asks that the combination, agreements and activities of the association be declared to constitute a conspiracy in restraint of interstate trade and commerce and to be illegal and in violation of the Sherman anti-trust act.

It also asks that the defendant, and each of them, their respective officers, agents, employes and all persons claiming to act on behalf of them be perpetually enjoined, individually and collectively, from further engaging in, agreeing to perform or in fact performing, said conspiracy, or any other of like character or effect.

Institute Issues Statement

The following statement has been issued by the Asphalt Shingle and Roofing Institute, against which the government has brought a suit under the anti-trust laws:

"It is understood that the purpose of the suit is to test the legality of the publicity agreement, merchandising plan and code of ethics of the institute.

"In the fall of 1929, when the roofing industry was in a seriously disorganized condition, a plan was worked out, based primarily upon publicity of prices, discounts, and other terms of sale, and the enforcement of a code of business ethics. This plan was adopted by the members of the Asphalt Shingle and Roofing Institute to put an end to then existing practices which were harmful to dealers, jobbers and to the consuming public as well as to the manufacturers and substantial progress has been made in doing away with objectionable trade practices and in stabilizing the industry.

"We do not understand that the Department of Justice claims that the consequences of the agreement have been harmful in any way to the industry from a business aspect, or oppressive to the public; but the government takes the position that the agreement in providing for a merchandising plan, including a system of discounts and freight equalization, and a method of exchanging published prices, tends to suppress competition and constitutes a violation of the Sherman anti-trust act. This view has been adopted by the Department of Justice notwithstanding the fact that the cardinal principle in all of the Institute's agreements is and has been that each manufacturer's prices shall be as he sees fit at all times, and may be changed by him at any time in any locality, to any one or more customers.

Revised Plan Adopted

"The members recently decided that certain features of the agreement which were objected to by the Department of Justice could be eliminated, and a new plan has been adopted to go into effect January 1, 1931, which is confined to an agreement for full publicity by the manufacturers of the prices and other terms upon which they are doing business, and a code of ethics. The Department of Justice was fully informed of this contemplated action and a copy of the plan was submitted to the government for inspection before being adopted by the members of the institute. Although approval of this plan has been withheld and the present suit has been begun, the Asphalt Shingle and Roofing Institute is convinced that full publicity, which is the basis of the present merchandising plan, is the best guaranty against dishonest business practices and an essential element of business stability.

"The decision in this case should be of unusual importance to all industries in further clarifying the anti-trust laws and in determining whether these laws as now drawn are a barrier to proper and necessary co-operation among business men in enforcing ethical business practices and in fostering conditions of reasonable stability."

New Scheme to Sell Sand and Aid Employment

A NEW PROJECT for the aid of the unemployed of the city, and one successfully tried in Detroit, will be launched by the emergency relief committee of Worcester, Mass., in the near future, according to Charles O. Hildreth, director of emergency relief in this city.

The plan to be attempted is the selling of sand to the householders of the city for use in sanding slippery and icy sidewalks. No definite preparations for the attempt of the venture have as yet been made by Mr. Hildreth, but should the policy prove as successful as the apple selling plan, he is prepared to place as many men as necessary at the work to make it a success.

In Detroit the plan has been tried and not found wanting. The co-operation rendered by householders has been most gratifying, and if as successful here as in Detroit it would be the means of providing a most generous living to scores of men.

Orders, as in Detroit, would be obtained by the publishing of blank order forms in the newspapers, which would be filled out and mailed to the local emergency relief office in the Chamber of Commerce building.

That the venture would be a profitable one, there is no doubt, if the householders of the city co-operate as they have in the apple selling plan. Preliminary investigation by Mr. Hildreth revealed that the cost of the heavy paper bags in which the sand would be carried is approximately 10 cents apiece. The cost of delivering the material and other miscellaneous expenses would be five cents, leaving a net profit of 10 cents a bag, if the cost were 25 cents as proposed.—*Worcester* (Mass.) *Post.*

Quarry Blasting

IN the November, 1930, issue of *Cement, Lime and Gravel*, an English publication, J. E. Lambert of the Imperial Chemical Industries, Ltd., reviews quarry blasting practices. He describes well drill, tunnel blasting, secondary blasting and the use of cordeau in connection with such work.

New Medusa Appointments

FRIENDS in the industry have just learned with pleasure of the appointments of Henry Vanderwerp and David H. MacFarland as vice-presidents, and W. L. White, Jr., as assistant general manager, of the Medusa Portland Cement Co.

H. Vanderwerp

Mr. Vanderwerp, who has been vice-president and general manager of the Manitowoc Portland Cement Co. since its inception in 1924, is now looking after Medusa's interests in Chicago, with temporary offices in the Builders building, where preparations are being made for a new suite to be occupied soon. Mr. MacFarland is located at the company's main office in Cleveland, as is Mr. White, who is in charge of manufacturing operations.

All three of the new appointees are cement officials with long and favorable records.

Served as Naval Officer

Mr. Vanderwerp entered the employ of the Newaygo Portland Cement Co. in 1910, under the late Daniel McCool, the enterprising founder of the Newaygo company. For many years he had been an officer in the naval militia and served during the World War as a lieutenant-commander in the U. S. Navy. At the outbreak of the World War, he became instructor in navigation at Great Lakes Naval Station, and subsequently he commanded several ships of the navy. Returning to private life, Mr. Vanderwerp resumed his duties at Newaygo, but shortly thereafter was appointed sales and traffic manager of the Petoskey Portland Cement Co., holding that position three years. At present he acts as vice-president of the Manitowoc Portland Cement Co. and the Cement Transit Co., in addition to his duties as vice-president of Medusa. He is a member of the conservation committee of the Portland Cement Association.

Authority on Sales and Advertising

David H. MacFarland was connected with the Atlas Portland Cement Co. for many years in a number of important capacities having to do with the direction of sales and advertising. He was for a long period in charge of the western sales office at Chicago and was later assistant to president in charge of important executive work at New York. A year ago Mr. MacFarland resigned to accept the position of assistant to president of the Medusa Portland Cement Co. Mr. MacFarland was chairman of the committee on advertising of the Portland Cement Association for several years and is a well-known authority on matters pertaining to advertising and sales.

Active in Safety Work

W. L. White, Jr., the new assistant general manager, has had a rapid rise through the ranks of the operating department during the last several years. Mr. White joined the Medusa organization seven years ago as superintendent of the mill at Bay Bridge, Ohio, and in 1925 was appointed general superintendent, with supervision over the four mills then included in Medusa operations. During the past year he has been in charge of the enlarged operating department including eight mills. He is generally credited with much of the company's recent success in accident prevention, operating all of the plants during 1930 with but one accident, involving a broken leg. Lost time due to accidental causes shrunk from 15,000 days in 1929 to 150 days, or 1% of the 1929 figure, in 1930.

W. L. White, Jr.

David H. McFarland

Universal Atlas to Build Storage and Sacking Plant

A NEW STORAGE terminal and sacking plant, representing an investment of over $1,000,000 is being planned by the Universal Atlas Cement Co., according to reports. This company, the largest Portland-cement producer in the United States, will situate its new project on the Maumee river at Toledo, Ohio.

Cement will be shipped to Toledo by boat upon completion of the new terminal to be distributed by truck and rail. A similar plant is being constructed by the same company at Milwaukee, Wis.

According to the Toledo Times, pipe-line facilities to the new plant have already been established by the Sun Oil Co.—*Columbus* (Ohio) *Dispatch.*

Glens Falls to Build New Kiln

PLANS OF THE Glens Falls Portland Cement Co., Glens Falls, N. Y., to build a new kiln at the cement works to cost between $300,000 and $325,000 have been announced by George F. Bayle, Sr., president of the company.

The work will be started without delay in order to provide as much employment as possible to workers in the building trades during the winter. It is expected the entire job will be completed within four or five months.

The decision to build a new kiln at an enormous expenditure reflects the optimistic belief of Mr. Bayle and the other officers of the cement company that the business depression is near an end.—*Schenectady* (N. Y.) *Union Star.*

Oklahoma Cement Mill Now Has 8-Hr. Day

THE Oklahoma Portland Cement Co., Ada, Okla., has begun operating on three eight-hour shifts instead of the two 12-hour shifts it has been using since the plant started, more than 20 years ago. The change was made in an effort to help the local unemployment situation and to keep in line with the plans of Governor Murray to relieve the situation throughout the state.

At the same time the work at the quarries at Lawrence was changed from two 10-hour shifts to two eight-hour shifts.

Previous to the closing of the plants for the Christmas holidays, the plants were running on 12-hour shifts. The shipment of cement had fallen off so greatly, however, that when work was resumed it was found necessary to eliminate 42 workers from the shipping department.

By going to the three shifts instead of two, the company has been able to put practically all of these back to work. It simply means, Manager M. O. Matthews explains, that the company is keeping its personnel intact in spite of the drop in shipments. There will not be any demand for additional employes.

The cement company has been making, and is still making, every effort to keep the wheels of the plants turning. Mr. Matthews announced in the fall that his company intended to keep the mills running if there was a chance in the world. The storage facilities are being filled, but the management hopes that the opening of work in the spring will relieve this to such an extent that the mills will continue to grind without curtailing the crews or the output of cement.—*Ada* (Okla.) *Weekly News.*

Kosmos Cement to Ship by River Barge

THE Kosmos Portland Cement Co., Louisville, Ky., manufacturers of cement for the past quarter of a century, will ship all its products for distribution in Evansville, Ind., by barges whose cargoes will be handled through the new river-rail terminal, according to communication received recently by J. D. Beeler, vice-president and general manager, Mead Johnson Terminal Corp., Evansville, Ind.

These negotiations will bring an average of 500 tons of cement per week through the local terminal for delivery to John L. Newman of this city, distribution agent, Mr. Beeler stated.

The Kosmos Portland Cement Co. operates a mill at Kosmosdale, Ky., with an annual production of 1,400,000 bbl. of cement and 500,000 bbl. of Kosmortar. Cement to be shipped via river is transported in bulk to a floating wharf and packing plant, where it is sacked and loaded on barges. Shipments of cement to Evansville will be made in the company's own steel barges and towed by its own boats.—*Evansville* (Ind.) *Courier.*

Lehigh Cement Installing New Equipment at New Castle Mill

WORK was started on the installation of new equipment at the plant of the Lehigh Portland Cement Co., New Castle, Penn., January 26, in preparation for the resumption of the plant in full at an early date, it was stated by Superintendent W. H. Kleckner.

While no definite date has been assigned for the resumption of the plant, it will probably be around March 1, Mr. Kleckner stated, as it will take fully that long to install the new machinery which has now arrived and is being put in the plant.

A complete new air separating unit will be put in at the plant and as soon as it is in readiness for operation the plant east of the city will start operations.

A force of approximately 20 men has been called back to work at the task of putting this machinery in place, and they will be kept busy until the job is completed.

The announcement made by Mr. Kleckner will be welcome news to New Castle people, as it indicates another step in the return to prosperous conditions locally.—*New Castle* (Penn.) *News.*

Louisiana State Highway Dept. Awards Cement Contracts

NINE COMPANIES were awarded contracts for supplying the Louisiana Highway Commission with 8,500,000 bbl. of portland cement, it was announced at the commission offices January 21. The average price paid was $2.20 a barrel, including discount.

The contracts were apportioned as follows: Lone Star Portland Cement Co., Louisiana, 2,500,000 bbl.; Oklahoma Portland Cement Co., 900,000 bbl.; Arkansas Portland Cement Co., 900,000 bbl.; Trinity Portland Cement Co., 1,200,000 bbl.; Alpha Portland Cement Co., 1,000,000 bbl.; Marquette Cement Manufacturing Co., 750,000 bbl.; Universal Atlas Cement Co., 500,000 bbl.; Lehigh Portland Cement Co., 500,000 bbl.; Signal Mountain Portland Cement Co., 250,000 bbl.

The average price paid for the 8,500,000 bbl., it was announced, was approximately 30 cents a barrel higher than the last year's 2,800,000 bbl. letting, due to the recent enactment of a higher portland cement tariff. A 60 cents per barrel discount was secured on the basis of cash payment, return of sacks and other factors.

The contracts do not mean that the Highway Commission has purchased the cement, but only that the commission will pay the prices fixed when it does come to buy it. The commission will benefit by any drop in prices, but will not have to pay any price increase.—*New Orleans* (La.) *States.*

Riverside Cement Company Improvements Completed

EARLE MacDONALD, general superintendent of the Riverside Cement Co., announced recently the completion of silos and other improvements recently undertaken at the Crestmore, Calif., plant of the company, and stated that manufacturing operations would be resumed in all departments of the plant at once.

Mr. MacDonald stated that the prospects for the year 1931 are distinctly encouraging. The various building projects of the federal, state and municipal governments are already having an effect upon construction activities and upon employment.

He anticipates that these public projects will have even a more important effect as the year goes on.

Mr. MacDonald expressed the company's appreciation of the efforts of the Riverside Chamber of Commerce and other organizations to have Riverside cement used in local building projects.—*Riverside* (Calif.) *Press.*

No Wage Cuts

The resuming of activities at the plant will release in this district hundreds of dollars a day, according to John Treanor, of Los Angeles, president of the company.

"The employes are being returned to their tasks on the same high wage scale our company has maintained for the period of many years," Mr. Treanor said. "The company has never approved wage cuts."—*Riverside* (Calif.) *Enterprise.*

North Carolina Cement Project Revived!

NUMEROUS local newspapers in North Carolina carry the following news item:

"Kinston, Feb. 2.—Possibility of a big cement plant in the section south of here is strong, according to information had in local business circles. Reports say $3,000,000 may be invested.

"Investigators have discovered that marl in Jones county is admirably adapted to the making of cement, and that other ingredients have been found in the territory.

"The Jones county marl is in unlimited quantities, some authorities say. Others have estimated it at 100,000,000 tons. Trent river cuts through a solid bed of it. The deposits are scattered over much of the county. They are found on hundreds of farms. Outside interests are concerned."

Colorado Feldspar Producer to Expand Operations

THE WESTERN FELDSPAR MILLING CO., Denver, Colo., is considering a new feldspar grinding mill at Canon City, Colo., to cost over $100,000 with machinery and other equipment.

This company already operates a plant at Denver (described in ROCK PRODUCTS, December 6, 1930).

Making Iron Separations in the Analysis of Portland Cement Raw Materials

By T. G. Ludgate
Chief Chemist, Oregon Portland Cement Co.

FOR those who have trouble in making iron separations, I would like to offer the method here given for their approval. This method is simple, can be accomplished in 30 minutes, and with very little practice in reading, the end point is very accurate.

Weigh 1-gm. sample into 250-cc. beaker, add 50 c.c. water, 10 c.c. concentrated HCl, and heat until dissolved, dilute with cold water to about 125 c.c., add stannous chloride solution from dropping bottle till the greenish yellow color disappears and the solution becomes colorless; then add three or four drops more, and place beaker in water to cool. When cool add 25 c.c. manganese sulphate solution and 10 c.c. mercuric chloride solution. Add these two solutions quickly, at the same time using a separate graduate for each, and stir. The precipitate should be silky. Transfer the solution to a white basin of about 2 litre capacity, washing out beaker with cold water, dilute to 1 litre with cold water, and titrate with potassium permanganate solution.

For limerock, shale, clay or slurry a fusion is obtained (if much silica separates out evaporate to dryness); this is taken up with water and 10 c.c. concentrated HCl in the usual way. Filter off silica, washing well, take filtrate and precipitate iron and alumina in the usual way, filter, wash precipitate from the filter back into the beaker from which it came, dissolve in 5 c.c. concentrated HCl, dilute to 150 c.c., and proceed as above.

If stannous chloride is added to a hot solution, color fades rapidly and not enough stannous chloride will be added to obtain the silky precipitate; if on adding manganese sulphate and mercuric chloride solutions the solution turns black, too much stannous chloride has been added and mercury precipitated.

The end point with potassium permanganate solution is very faint and disappears rapidly; hence the reason for diluting to 1 litre and the use of white basin. Whenever the solution takes and holds a faint pink color for 15 or 20 seconds the end point has been reached; take reading, and then add quickly two or three drops more, titrating the while. A very definite color should be obtained which fades rapidly; take first reading, which multiplied by factor equals Fe_2O_3. Titration should be done in a good light (daylight but not in sunlight).

Solutions

For potassium permanganate solution use 1.975 gm. potassium permanganate to 1 litre; standardize by 0.49 gm. pure ferrous ammonium sulphate (equal 1 gm. Fe_2O_3), dissolve in 50 c.c. water (without heating), add 10 c.c. dilute sulphuric acid (1-1) and titrate with potassium permanganate till solution turns and holds a light pink; divide weight of ferric oxide (0.1 gm.) by number c.c. potassium permanganate solution required; result is Fe_2O_3 to 1 c.c. $KmNO_4$.

Mercuric chloride is a saturated solution.

Manganese sulphate is made up in the proportion of:

Manganese sulphate, 67 gm.

Phosphoric acid, 138 c.c. in 500 c.c. water dilute to 1 litre.

Sulphuric acid, 130 c.c.

Stannous chloride in the proportion of:

Twenty-five gm. stannous chloride dissolved in 100 c.c. HCl, dilute to 1 litre; make up only 50 c.c. at one time, keep air tight, and add a little tin metal to keep stannous (this solution is only good for several weeks and should be made up fresh at intervals).

Perchloric Acid for the Determination of Silica in Limestones

By Carroll B. Core
Assistant Chief Chemist, Southwestern Portland Cement Co., Victorville, Calif.

IN A JULY ISSUE of ROCK PRODUCTS, Wallace K. Gibson gives an interesting article on perchloric acid method for the determination of silica. Later, in October, C. F. Pinkerton describes a modification of this method. Mr. Wallace mentions the possible danger due to explosions. Mr. Pinkerton claims that if a 60% solution is used, there is no danger of explosion. It is the writer's opinion that there is always danger of explosion if proper care is not used in the handling of the acid.

Anhydrous perchloric acid is a strong oxidizer. Phosphorus, carbon and other combustible substances are set on fire by it, frequently with explosive violence. A few drops of perchloric acid will explode with great energy when brought in contact with charcoal. It attacks animal tissues causing serious wounds. Hydrochloric acid does not decompose it. When dissolved in water, perchloric acid is a stable compound.

Generally speaking, the 60% perchloric acid solution is safer to handle than the 70%. Acid of either strength can be purchased anywhere. It is neither poisonous nor explosive. In most cases it is non-oxidizing except near the boiling point of 203 deg. C. At this temperature it is an energetic oxidizing agent. For this reason it is valuable in the determination of silica. However, certain precaution must be taken. The contact of the boiling liquid or the hot perchloric acid vapors with organic, or easily oxidized inorganic matter, will result in serious and violent explosions. The writer has witnessed such an explosion, when the hot perchloric acid vapors came in contact with a rubber policeman in a nearby beaker.

If care is taken, silica obtained by the perchloric acid method is purer than when hydrochloric acid is used. The time required is much less, and the salts formed are quickly and completely soluble. Check results of silicas analyzed by both methods show that the perchloric acid dehydration of silica is equivalent to a double evaporation of the hydrochloric acid method. The silica is granular and filters rapidly.

If possible, avoid fusion of the raw material. Be sure to use enough perchloric acid, otherwise insoluble perchlorates may separate out. Enough should be taken to insure a liquid and not a pasty or dry mass at the

fuming point. If the solution is evaporated to such a mass, it will be impossible to obtain a complete separation of silica. Too much perchloric acid will cause a needless waste of time and material.

Mr. Pinkerton claims that calcium carbonate of 90% purity can be ignited and analyzed without fusion. This can also be applied to limestones containing as much as 16% SiO_2 and 7.5% R_2O_3, if the sample is first blasted to a sintered mass. The silica is converted to a soluble silicate which usually is easily detached from the crucible and readily soluble in acid.

The following method of procedure was devised by Carl Prince, an analyst of this company. It is rapid and does away with fusion if the above mentioned percentages are not exceeded.

One-half gram of the powdered limestone is weighed into a platinum crucible and ignited with the cover on for 10 minutes over a good blast capable of giving a temperature of 2000 deg. F. to 2200 deg. F. The sintered or clinkered mass is detached from the crucible and placed in a tall 100-c.c. beaker. The crucible is then cleaned with 1:1 HCl and the contents washed into the 100-c.c. beaker. Break up the lump by using the flattened tip of a glass rod and heat to boiling. Cool and add 10-15 c.c. of 60% perchloric acid. Evaporate until copious fumes of $HClO_4$ come off. Boil gently for 10 minutes and then cool to room temperature. Usually upon cooling the solution becomes solid. Dilute to four times its volume with water and add a few c.c. of 1:1 HCl. Bring to a boil. Cool and filter the silica. Wash once with dilute HCl and then with hot water until all the chlorides are removed. Ignite in the usual manner and then weigh.

The late Richard K. Meade claimed that when siliceous components are in such amount as to not form a wholly soluble product by strong ignition, it is necessary to mix a little sodium carbonate to the powder and decompose the silicate by its aid with a blast lamp. The amount of flux to be used is but a fraction of that needed for a silicate analysis. One-fourth to one-half gram suffices, since the lime formed by ignition is a powerful flux in itself. This proportion holds for cement rocks containing as little as 50% calcium carbonate.

The analyst should find the above method economical. The time and trouble of fusion is saved. The possibility of error is less since sodium carbonate introduces more impurities and necessitates longer washing of the precipitate.

Smelting of Wyomingite and Phosphate Rock

ACCORDING to a paper by T. P. Hignett and P. H. Royster of the United States Bureau of Chemistry and Soils, which they presented at the Cincinnati, Ohio, meeting of the American Chemical Society during September, 1930, Wyoming leucite, western phosphate rock, limestone and Rock Springs coal, when smelted in a blast furnace, resulted in production figures that indicate that it should be possible to produce K_2O and P_2O_5 at a plant cost of $25 per ton.

Results obtained indicated a volatilization of more than 90% of both the K_2O and P_2O_5. This result, they state, seems to depend on high temperature heat to drive off the P_2O_5, while volatilization of the K_2O is dependent on the addition of chlorides.

Dust Control in Phosphate Grinding

IN THE OCTOBER, 1930, issue of *Industrial and Engineering Chemistry,* W. H. Gabeler, of the Davison Chemical Co., writes of that company's experience in recovering minus 2-micron dust from 12 Raymond mills used for preparing phosphate rock for acidulation.

The 12 vents gave off sufficient dust to constitute a nuisance, so several methods of collecting this dust were tried, which included water spray devices, small diameter cyclones on the vents operating dry and in conjunction with sprays, and a wet washer, but all proved unsatisfactory.

Finally a two-compartment Dracco filter for each set of two vents was installed, and this was said to have collected 99% of the dust.

Following are some of the data relative to recoveries:

Amount of air from each vent—900 cu. ft./min.
Dust collected per two mills—32 lb./hr.
Capacity of each mill—4 tons/hr.
Fineness of cyclone dust—5-100 microns.
Fineness of vent dust— —2 microns.
Dust concentration—2.05 gm./cu. ft.

Other information relative to the negative methods that were tried are also included in the article.

Determination of Magnesium in Portland Cement

THE MAXIMUM AMOUNT of magnesia (MgO) allowed by federal specification 1a and the standard specification for portland cement (C9—26) of the American Society for Testing Materials, is 5.00% (plus a tolerance of 0.4%). Since a great deal of cement is purchased under these specifications it follows that many determinations of magnesia are required. At present the phosphate method is standard, and is quite accurate and proper for umpire analyses, but it is rather lengthy. The precipitation of magnesium by the reagent 8-hydroxyquinoline has been studied at the bureau, and in the January, 1931, number of its *Journal of Research* a method is recommended for determining magnesium by use of this reagent. The recommended procedure is accurate and much more rapid than the standard phosphate method.—*Technical News Bulletin,* of the U. S. Bureau of Standards.

Developments in the Phosphate Industry

AT the September, 1930, meeting of the American Chemical Society, K. D. Jacob, of the United States Bureau of Chemistry and Soils, presented a paper on recent developments in the phosphate industry, paying particular attention to the utilization of low-grade and waste phosphate rock, the manufacture of phosphoric acid by the furnace process, the manufacture of superphosphate and triple superphosphate, and the treatment of superphosphates with anhydrous and aqueous ammonia.

Composition of Phosphates

AT THE SEPTEMBER, 1930, meeting of the American Chemical Society, W. L. Hill, K. D. Jacob, L. T. Alexander and H. L. Marshall, of the United States Bureau of Chemistry and Soils, presented a paper entitled: "Chemical and Physical Composition of Certain Finely Divided Natural Phosphates of Florida."

The authors deal with the chemical and physical composition of natural soft and waste-pond phosphates from Florida. The results given in the paper include data on the physical composition of the samples, effect of temperature on the physical composition, specific gravity, chemical composition of the original phosphates and the mechanical fractions separated therefrom. They also include data on the solubility of phosphoric acid in neutral ammonium citrate and dilute citric acid solutions.

Talc Mine Now Operating

ACTUAL PRODUCTION of talc in the Marble Mount mine on the Skagit river, Washington State, was started the latter part of December with men working in two shifts, quarrying the blocks of talc and then reducing it to blocks in the warehouse below, according to Joe Carpenter, secretary-treasurer of the company.

The mine, financed by local capital, with Frank Casler, president; Fred Hubbard, vice-president; Jack Waugh and John Wilson, trustees, is located 25 miles above Concrete, Wash.

Twenty-eight thousand dollars has been invested in the mine to date, mostly for equipment, according to Mr. Carpenter. The talc is brought down to the warehouse from the quarry in tram cars and reduced to blocks which are then shipped to Seattle and coast cities on the Seattle railway.

The talc, which has been contracted for by a Seattle firm at $55 a ton f.o.b. the mine, is being used for lining furnaces in pulp mills.

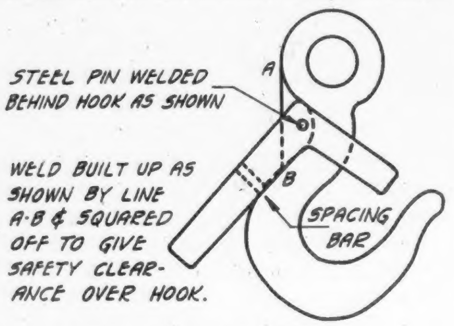
Officers of the organization say that they can compete with talc markets in the east and expansion is planned. Freight rates, which are less east than west, put them in a position where they can control the coast market.—*Wenatchee* (Wash.) *World.*

Hints and Helps for Superintendents

Safety Block

By W. L. Home
Englewood, N. J.

THE SAFETY HOOK shown in the accompanying sketch can be built by a welder in a short time. If properly made it is as efficient as hooks far more costly and more complicated. In addition safety hooks of the correct size are not always available



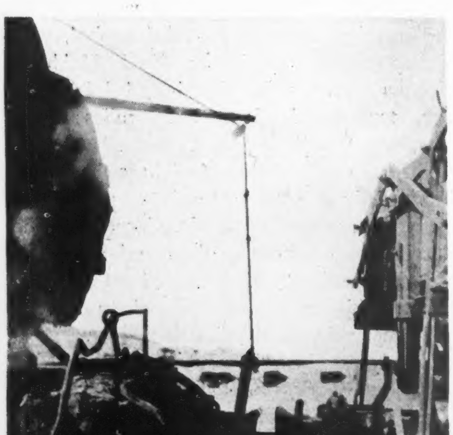
Safety hook of simple design

for immediate delivery. The method of attaching the safety strengthens rather than weakens the hook.

Simple Switch Operating and Coupling Devices in a Quarrying Operation

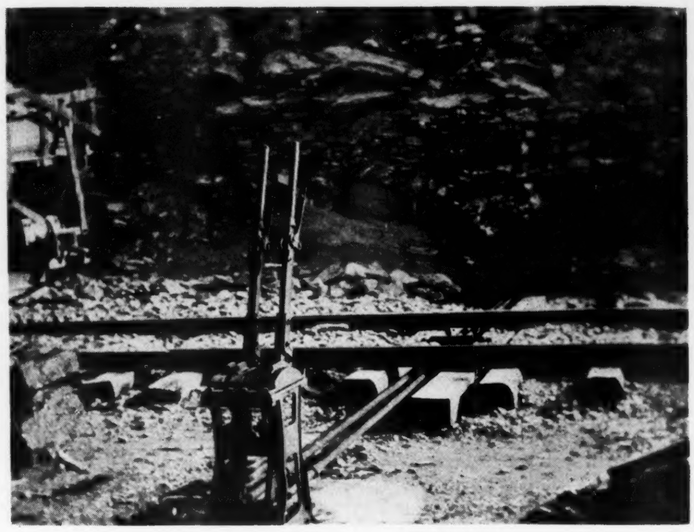
TWO VERY SIMPLE and interesting labor saving schemes are used by the France Quarries Co. at its Kenton, Ohio, crushing plant.

The loaded cars from the quarry are switched in to the foot of the incline on one track, and the empty cars are then hauled out by the same locomotive from the track alongside, in the usual way. The switch for the empty car siding is several hundred feet from the foot of the incline, and is connected through bell cranks and pipe with an operating lever located near the incline, so that the car hooker can easily throw the switch for the locomotive. This switch operating mechanism is standard equipment as used by the railroads, and is installed in a permanent manner.



Method of coupling locomotive to quarry cars

The other scheme is what might be termed an automatic coupler on the locomotive. Link and pin type couplers are used on this quarry equipment. The top hole of the coupler on the front end of the locomotive is fitted with a short piece of pipe so that the pin is free to slide up and down in it. A piece of bell cord rope fastened to the pin is carried over a pulley above the pipe and run into the cab, so that the pin may be pulled up or let down by the locomotive runner. Uncoupling is of course simply a matter of taking up slack and hooking up the cord, which pulls the coupler pin. Coupling is practically as sure, since the car hooker blocks up the link on the end car of the empty train with a small piece of stone so that it will enter the coupler on the locomotive. These two simple contrivances save at least one man at this point.



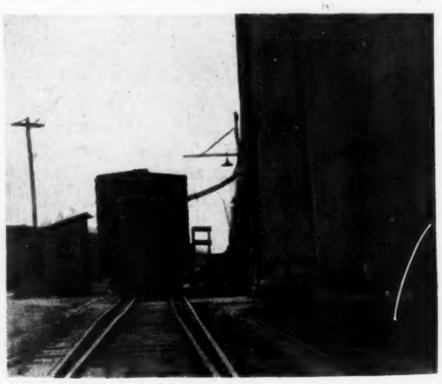
Switch levers used to throw switches from a distance in the quarry

Loading Bulk Cement

THE PRACTICE of shipping bulk cement on the Pacific Coast is not as extensively followed as in some of the eastern industrial centers, except in a few isolated cases where the cement is going for hydro-electric dam construction purposes.

At the plant of the Superior Portland Cement Co., Concrete, Wash., bulk cement is taken from the silos by a screw conveyor and delivered to a bucket elevator from which the material is spouted to box cars.

The cars, lined with paper, are spotted on track scales and weighed as being loaded



Loading bulk cement with cars mounted on track scales

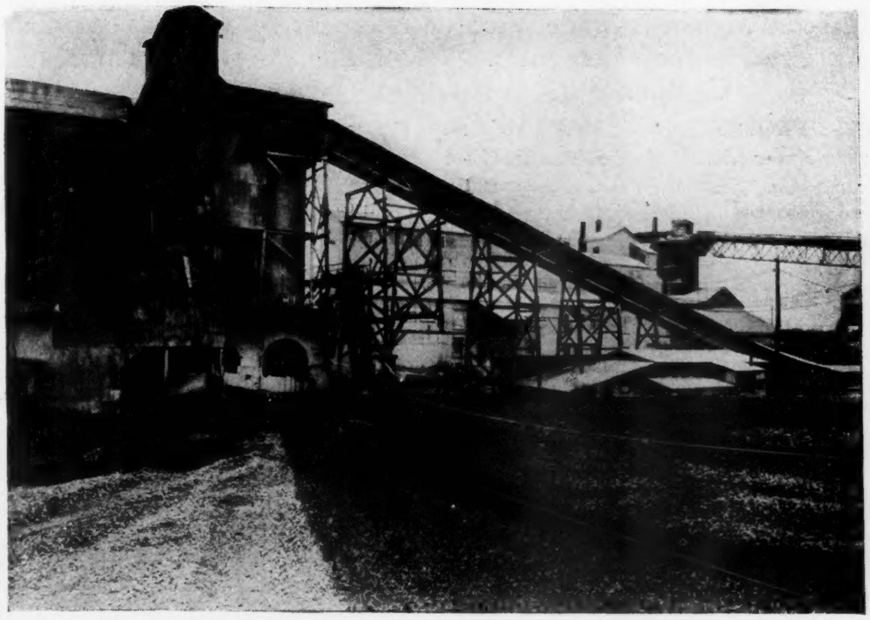
which prevents any trouble incidental to overloading or underloading.

Scraper Stockpiling

FOR STOCKPILING and reclaiming five different sizes of stone at the Berkeley, W. Va., plant of the North American Cement Corp., the company uses a ¾-yd. Sauerman electric portable scraper.

The five separate storage piles radiate away from the "initial piles" and are about 300 ft. long and in some instances 30 ft. high, yet the scraper has been found very adaptable for the work, moving 50 tons per hour, which is ample for the company's requirements.

The Berkeley plant is a lime-burning op-



Scraper used for moving stone from crushing plant to storage pile

eration primarily, and the unit is said to be one of the most efficient as to fuel consumption in the United States. The spalls from the quarry are used for the production of commercial stone, and it is this product that the scraper handles.

Economical Truck Haulage in Quarry

A METHOD of using trucks for the transportation of stone in the quarry, even though the primary crusher is at the top of an incline too far above the quarry floor to make haulage to it practicable, is indicated in the accompanying photograph.

Here two 3-yd. trucks hauling a distance of about 700 ft. and working a round trip in about 6 minutes handle 60 tons of stone per hour from an electric shovel to the 3-yd. end-dump car shown. The car is connected by cable with a drum hoist in the crushing plant above and is hoisted up the incline and dumped to the primary crusher between trips of the trucks.

Thus the trucks are enabled to operate on the level quarry floor without having to do any climbing, and a less number are required by using them in connection with the car and incline. This operation is at the plant of the Kokomo Stone Co., Kokomo, Ind.

Learning Electric Welding

ELECTRIC AND GAS WELDING at most plants has been in the past more or less of a hit-and-miss proposition; one of the most progressive mechanics would take it up as a sort of side line and, from what information he could pick up here and there, would eventually become what the company considered an "expert" welder.

A cement executive in whose plant such was the history of their welding knowledge, decided to send his best welder to Pittsburgh to attend a school sponsored by the Westinghouse Electric and Manufacturing Co., conducted for the purpose of teaching electric welding.

The management of the cement plant reported that where the man sent was a good welder before he entered this school, a few weeks there made his value to the company a distinct asset, as he picked up many of the finer points in electric welding that permitted him to confidently tackle jobs that he otherwise would have been dubious about just how to handle.

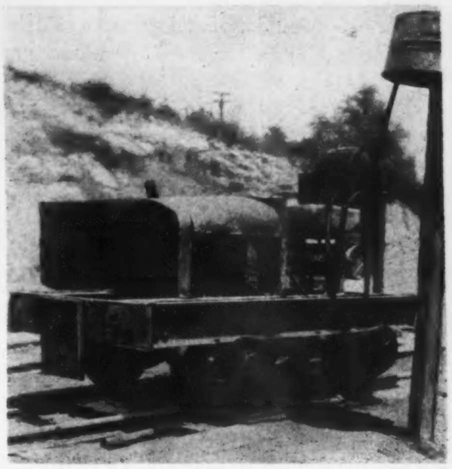
Truck dumping to quarry car on incline

Thawing Frozen Bin Gates

WHEN the loading gates at the Birdsboro quarry of the John T. Dyer Quarry Co. become frozen shut, they move one of the steam locomotives under the gate, turn on the blower, and the trick is turned.

Improvised Quarry Locomotive

WE COULD NOT HAZARD a guess as to the number of different types of home-made locomotives seen throughout North America, but perhaps one of the simplest was that built by Max Altgelt, president and general manager of the New Braunfels Limestone Co. at his quarry near New Braunfels, Tex. A couple of quarry car trucks, an old engine from a "flivver" and a simple chain drive, as shown in the illustration, comprised this quarry locomotive.



Home-made quarry locomtive

Cement Manufacturers Meet to Co-ordinate Credit

IMPROVEMENT of credit conditions in the cement industry, with a corresponding decrease in the number of bad accounts during the last six months, was reported by delegates attending the annual convention of the central cement group, building material manufacturers' division of the National Association of Credit Men, in the Bankhead Hotel, Birmingham, Ala., the latter part of January.

The gathering was held as a means of establishing closer contact between the cement industry and manufacturers of other building materials. The conference also sought co-operation of delegates in obtaining facts relative to credit ratings and business ethics.

L. N. Massengale, Birmingham, was elected vice-president of the group. Those present for the conference Tuesday were: E. H. Lothian; E. W. McGovern, Hermitage Portland Cement Co., Nashville; A. C. Woodard, Alpha Portland Cement Co., Birmingham; C. C. Duff, Lone Star Cement Co., Birmingham; Frank Pearson, Cumberland Portland Cement Co., Cowan, Tenn.; E. B. Odenkirk, Medusa Portland Cement Co., Cleveland, Ohio; L. N. Massengale, National Portland Cement Co., Birmingham; J. W. Worrell, Woodstock Slag Corp., Birmingham; S. L. Cribari, Marquette Portland Cement Co., Memphis; John Purdy, Jr., Universal Atlas Cement Co., Birmingham; J. A. Hiller, Signal Mountain Portland Cement Co., Chattanooga; R. J. Siegfried, Lehigh Portland Cement Co., Birmingham; A. B. Hardin, Pennsylvania-Dixie Cement Corp., Chattanooga; E. Ballestier, Jr., department director of the cement group, New York; W. C. Darby, Merchants Credit Association, Birmingham.

Alabama Highway Board Lets Contracts for Cement

ADDITIONAL ORDERS for 87,500 bbl. of cement to five manufacturing companies through contracts given out by the State Board of Administration, Montgomery, for a federal aid highway project of 23 miles in Mobile county were placed January 24.

The cement is to be shipped to Whistler and Citronelle, near Mobile. The paving contract was awarded the Couch Construction Co. of Mobile, the work to cost approximately $450,000. This cost is being equally divided between Mobile county and the federal government, no state funds being involved.

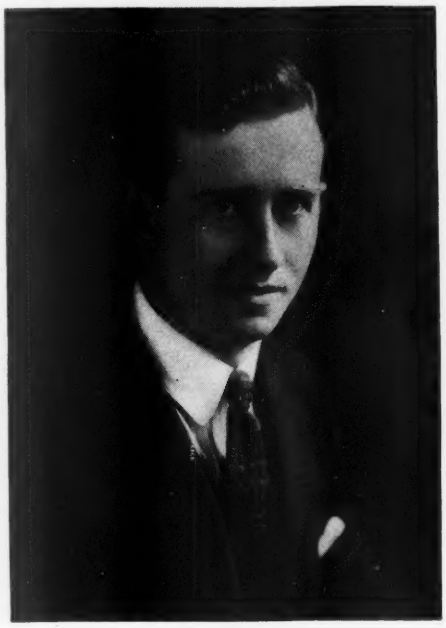
The cement was purchased at a cost of $2.51 a barrel and is divided as follows:

Lone Star Cement Co., 25,428 bbl.; Universal Atlas Cement Co., 3325 bbl.; National Cement Co., 9931 bbl.; Lehigh Cement Co., 24,859 bbl., and Alpha Portland Cement Co., 23,957 bbl.—*Birmingham* (Ala.) *News*.

Darwin Meisnest Made Vice-President of Cement Company

THE PROMOTION of Darwin Meisnest to vice-president of the Pacific Coast Cement Co., Seattle, Wash., has recently been announced. This is in addition to his title of general sales manager, which he retains.

Mr. Meisnest's rise has been rapid during the two years he has been connected with



Darwin Meisnest
Photo by Grady

the Seattle cement company, and he is the youngest person ever promoted to an executive position in the corporation, being only 35 years old.

He is a graduate of the University of Washington, 1919, and previous to coming with the cement company he was graduate manager for Associated Students of the University of Washington for nine years.

Lime in Agriculture

THE INNUMERABLE FUNCTIONS of lime are discussed in considerable detail in a bulletin entitled "Lime in Agriculture," which has just been issued by the National Lime Association, Washington, D. C.

As the foreword states, the application of lime to soils is not the only important use this material has on the farm. There is no substitute for lime, as a foundation material, in the several dusts and sprays used to combat plant diseases and insects, and these are but two of the many uses for lime taken up in the chapters covering the importance of lime to the human body, soil liming, lime for various crops, lime in crop protection, lime in animal nutrition, and lime in farm construction.

Cement Man Leads Work for Public Safety at Tampa, Fla.

CREATION of a safety council for the city of Tampa, Fla., as a means of reducing a heavy toll being paid by workers, pedestrians, and motorists was urged recently by C. E. Caron, plant superintendent of the Florida Portland Cement Co., whose accident prevention policies have just won national recognition.

The Tampa cement plant, operating a hazardous type of industry, has rounded out two years without a single accident, a record believed to be excelled by only one other industrial plant in the country, a mill in Ohio.

The safety record is attributed to the company's continual attention to keeping its employes alert to unsafe places and practices. Safety meetings are held every two weeks by foremen and department heads who then conduct their own campaigns with their workers for competitive safety records. Every man in the mill is trained in the United States Bureau of Mines' first aid work and a 10-question written examination is given every two weeks.

A similar service is available to the city of Tampa through the National Safety Council if the city will follow up the payment of its $25 membership in the national organization with appointment of a local council to conduct the work, Mr. Caron said. Many other cities with special safety councils are deriving excellent benefits.

The accident prevention publicity is considered a great assistance to the police department, and wherever used has served to reduce the number of accidents to school children, and has reduced the number of deaths and injuries by hit-and-run drivers, he pointed out.

Mr. Caron pointed to the Tampa Electric Co. and the Atlantic Coast Line railroad as two examples of other Tampa concerns that are benefiting from co-operation with the National Safety Council in accident prevention training and first aid education.—*Tampa* (Fla.) *Tribune*.

Canada Cement Lets Contract for Port Colborne Plant

THE CANADA CEMENT CO., LTD., Montreal, Que., has let contract to F. L. Smidth and Co., Canada, Ltd., Montreal, for machinery required to convert its No. 8 plant at Port Colborne, Ont., from dry to wet process. The order includes a new rotary kiln approximately 420 ft. long of the Smidth high efficiency type with Unax cooler and chain system and new raw mill consisting of two Smidth Unidan mills with complete Smidth agitator equipment.

The Canada Cement Co. has completed the conversion of its No. 1 plant at Montreal from dry to wet using four Unax kilns and five Unikom mills, also furnished by F. L. Smidth and Co., Canada, Ltd.

Editorial Comment

Scrapping of Trade Practice Codes

As we anticipated, the Federal Trade Commission in its "revision" of its first approved trade practice code—that of the petroleum industry, adopted July 25, 1929—has absolutely annihilated all parts of the code that were of any assistance in meeting the real situation of industry today. Not only were all the "Group 2" rules thrown out, but, much more surprising, the "Group 1" rules were reduced from seven to three in number. Really, the only relevant rule left, of value to this or any other industry, is the one forbidding the sale of goods below cost, but only if this is done with the effect, as well as the intent, of injuring a competitor and the further effect of *substantially* lessening competition. Small comfort for those industries which went to much time, trouble, expense and mental effort to adopt "codes of fair business practice"!

Philosophers For Managers

A kindly, sympathetic friend and reader (incidentally, a "philosopher-manager") writes: "I read with considerable interest your first page editorial in the January 31 issue ["Business Association Leadership"]. Like all real philosophy it does not get anywhere in particular." We accept this, as we are sure it was intended, as a compliment; because the editorial in question was really intended to be a philosophical discussion, it is a compliment to have it referred to as "real philosophy."

There are many definitions of philosophy; literally it means "love of wisdom"; the one we like the best is that of Josiah Royce: "Philosophy . . . has its origin and value in an attempt to give a reasonable account of our personal attitude towards the more serious business of life." That is to say, it is an attempt to apply reason, or logic, to the management of our affairs. And, it might be added, because a great majority of the managers of American industry are earnestly trying to do this, the future of American industry and business is indeed bright.

As we vision the future of industry and business there is now, or soon will be, a crucial test of the present type of management to conduct business affairs so as to render a genuine, satisfactory public service, or have business so regulated and controlled by a government "of the people, by the people, for the people," that future generations of management will prefer government ownership to government intermeddling. Therefore, to use a common commercial term, present industrial management has the problem of "selling" itself to the public.

Rock Products has always believed that business, industrial or trade associations, as ordinarily conducted, are not merely necessary institutions for their particular industries, but that they are the hope of the future for developing industrial leadership to save us from government ownership, or communism. Hence our essay on association leadership and how it is generated, developed and encouraged. One of these days we may expand our thoughts by calling attention to some deplorable examples of lack of association leadership and their causes. Suffice to say now, as we noted in the editorial referred to, there is a large element of unselfishness in genuine, able leadership. And more unselfishness—or maybe better "enlightened selfishness"—in the management of industry is, to our mind, its only salvation from government ownership.

We feel our discussion is very much strengthened by an article on "Management" in the February 5 issue of the *Wall Street Journal*, by Thomas F. Woodlock; who, after quoting from Governor Pinchot's, and Senator Capper's rhetoric attacking modern business management, writes:

> In the light of what psychologists and biologists have to say, we need not allow ourselves to become greatly alarmed or excited by either Governor Pinchot's or Senator Capper's fervid, if shrill, exhortations. But they may serve to recall to our minds the fundamental change that has occurred in our economic structure in the last two generations—change which differentiates our world today from that which "our forefathers" knew in almost as many important respects as from the world of the first Augustus.
>
> The essence of that change is the intimate interdependence of all our economic relations coupled with the rise to the very first rank of importance of an almost wholly new factor in those relations, namely, "management" or "leadership," or whatever one chooses to call it. Interdependence, moreover, is not merely internal to our nation, but is also external. The entire world is embraced in what is a gigantic co-operative enterprise rendered not merely possible, but necessary as a result of the revolution in transportation of men, material and ideas. Management is the unifying principle upon which the efficiency of that co-operative machinery most directly depends, and the living standards of the world depend directly upon the efficiency of that machinery. The "state of mind" underlying the utterances of Messrs. Pinchot and Capper is merely a strong emotional urge to "change the management" and place it in the hands of "the people." It is but another manifestation of the idea for which the fashionable label at present is "social control."
>
> Pausing merely to note that it was a "republican" and not a "democratic" form of government that our "forefathers" bequeathed to us—a distinction much neglected in the thought and the talk of present days, but nevertheless a most important distinction—what the "social controllers" want is "direct democracy" in industry and commerce as well as in politics. (The industrial and commercial structure is today "governed" by a method rather closely analogous to that of the Roman republic before the advent of the Gracchi.) If there is one thing reasonably certain it is that "direct democracy" in industry and commerce will mean a pronounced change in "standards of living" for everyone, and it will not be for the better. While it is at least arguable that a lowering in these might be none too high a price to pay for other aims, do our "social controllers" recognize that there is a price to pay, and are they willing to pay it? Are we talking "materials" or "spirituals" or what?

So we hope, if our attempts at writing philosophy accomplish no other purpose, they will at least induce or inspire those in any way or degree responsible for industrial management, to take time out occasionally for a little contemplation of industry, government, society, in a large way; and of their own very important part in the existing scheme of things.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	2- 9-31	93		
Alpha P. C. new com.[2]	2- 7-31	16½	18	50c qu. Jan. 24
Alpha P. C. pfd.[2]	2- 7-31	117	123	1.75 qu. Dec. 15
Amalgamated Phosphate Co. 6's 1936[19]	2- 4-31	99½	100½	
American Aggregates com.	2-11-31	10	15	75c qu. Mar. 1
Am. Aggr. 6's, bonds	2-11-31	73⅛		
American Brick Co., sand-lime brick	10- 6-30	4½		25c qu. Feb. 1, '30
American Brick Co. pfd.	1-12-31	50	57	50c qu. May 1, '30
Am. L. & S. 1st 7's[27]	2- 9-31	94		
American SilicaCorp. 6½'s[39]	2-10-31	No market		
Arundel Corp. new com.	2- 9-31	40½	41	75c qu. Jan. 2
Beaver P. C. 1st 7's[20]	1-23-31	93	95	
Bessemer L. & C. Cl. A[4]	2- 7-31	30	32	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'[4]	2- 7-31	92	95	
Bloomington Limestone 6's[27]	2- 9-31	52	57	
Boston S. & G. new com.[37]	2- 7-31	14	17	40c qu. Jan. 2
Boston S. G. new 7% pfd.[37]	2- 7-31	43½	47½	87½c qu. Jan. 2
California Art Tile A	2- 5-31	2	5½	43¾c qu. Mar. 31
California Art Tile B[40]	2- 5-31		3	20c qu. Mar. 31
Calaveras Cement com.	2- 5-31		11	
Calaveras Cement 7% pfd.	2- 5-31		79	1.75 qu. Jan. 15
Canada Cement com.	2- 9-31	12⅛	12½	
Canada Cement pfd.	2- 9-31	93½	94	1.62½ qu. Dec. 31
Canada Cement 5½'s[34]	2- 6-31	99½		
Canada Cr. St. Corp. bonds[34]	2- 6-31	92	97	
Certainteed Prod. com.	2- 9-31	3½	3⅝	
Certainteed Prod. pfd.	2- 9-31	13	16	1.75 qu. Jan. 1
Cleveland Quarries	2- 9-31	61	65	75c qu. 25c ex. Mar. 1
Columbia S. & G. pfd.	2-10-31	82	90	
Consol. Cement 1st 6½'s. A	2-10-31	30	40	
Consol. Cement 6½% notes[23]	2-10-31	35	45	
Consol. Cement pfd.[27]	2- 9-31	10	20	
Consol. Oka S. & G. 6½'s[12] (Canada)	2- 7-31	100	102	
Consol. Rock Prod. com.[9]	2- 5-31	75c	1	
Consol. Rock Prod. pfd.[9]	2- 5-31	3½	4	43¾c qu.June 1,'30
Consol. Rock Prod. units	2- 9-31	8	10	
Consol. S. & G. pfd. (Can.)	2- 9-31		77	1.75 qu. Feb. 16
Construction Mat. com.	2- 9-31	8½	9	
Construction Mat. pfd.	2- 9-31	29	31	87½c qu. Feb. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	2- 5-31	76	80	
Coosa P. C. 1st 6's[27]	2- 9-31	40	50	
Coplay Cem. Mfg. 1st 6's[33]	2- 7-31	95		
Coplay Cem. Mfg. com.[33]	2- 7-31	10		
Coplay Cem.Mfg. pfd.[33]	2- 7-31	60		
Dolese & Shepard	2- 9-31	60	64	$2 qu. Jan. 2
Dufferin Pav. & Cr. Stone com.	2- 9-31	7½	13	
Dufferin Pav. & Cr. Stone pfd.	2- 9-31	80	82	1.75 qu. Jan. 2
Edison P. C. com.[32]	2- 7-31	50c		
Edison P. C. pfd.[32]	2- 7-31	2		
Federal P. C. 6½'s, 1941[19]	2- 4-31	96	100	
Giant P. C. com.[2]	2- 7-31	3	10	
Giant P. C. pfd.[2]	2- 7-31	25	30	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	2- 9-31	11½	11⅝	20c qu. Jan. 2
Hermitage Cement com.[11]	2- 7-31	25	30	
Hermitage Cement pfd.[11]	2- 7-31	75	85	
Ideal Cement, new com.	2- 9-31	47	49	75c qu. Jan. 1 & 50c ex. Dec. 22
Ideal Cement 5's, 1943[29]	2- 7-31	95	99	
Indiana Limestone com.[27]	2- 9-31	3	6	
Indiana Limestone pfd.[27]	2- 9-31	50	60	
Indiana Limestone 6's	2-10-31	50½	51¼	
International Cem. com.	2- 9-31	56¾	57	$1 qu. Dec. 31
International Cem. bonds 5's	2- 9-31	97½		Semi-ann. int.
Iron City S. & G. bonds 6's[36]	11- 1-30	90	93	
Kelley Is. L. & T. new stock	2- 9-31	34½	40	62½c qu. Jan. 2
Ky. Cons. St. com. V. T. C.[38]	2- 5-31	4	6	
Ky. Cons. Stone 6½'s[38]	2- 5-31	82	85	
Ky. Cons. Stone com.[38]	2- 5-31	4	6	
Ky. Cons. Stone pfd.[38]	2- 5-31	75	80	$1.75 qu. Feb. 1
Ky. Rock Asphalt com.[11]	2- 7-31	5	7	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	2- 7-31	70	80	1.75 qu. Dec. 1
Ky. Rock Asphalt 6½'s[11]	2- 7-31	85	90	
Lawrence P. C.[2]	2- 7-31	51	56	$1 qu. Dec. 29
Lawrence P. C. 5½'s, 1942[2]	2- 7-31	87		
Lehigh P. C.	2- 9-31	18	18½	25c qu. Feb. 2
Lehigh P. C. pfd.	2- 9-31	99⅝	102	1.75 qu. Apr. 1
Louisville Cement[7]	2- 5-31	175	225	

Stock	Date	Bid	Asked	Dividend
Lyman-Richey 1st 6's, 1932[13]	2- 6-31	97½	99½	
Lyman-Richey 1st 6's, 1935[13]	2- 6-31	97	99	
Marblehead Lime 6's[14]	2- 6-31	90	95	
Marbelite Corp. com. (cement products)	11-29-30		3	
Marbelite Corp. pfd.	1- 8-31	5		50c qu. Oct. 10, '30
Material Service Corp.	2-10-31	18	18½	50c qu. Mar. 1
McCrady-Rogers 7% pfd.[22]	2- 6-31	45	50	87½c qu. Dec. 31
McCrady-Rogers com.[22]	2- 6-31	15	20	75c Jan. 26
Medusa Portland Cement	2- 9-31	64	65	1.50 Jan. 1
Michigan L. & C. com.[6]	12-27-30	40		
Missouri P. C.	2- 9-31	28⅞	29	50c qu. Jan. 31
Monolith Portland Midwest[9]	2- 5-31	1¾	2½	
Monolith P. C. com.[9]	2- 5-31	3	4	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	2- 5-31	4	5	40c s.-a. Jan. 1
Monolith P. C. units[9]	2- 5-31	10	12	
National Cem. (Can.) 1st 7's[34]	2- 6-31	98½	100	
National Gypsum A com.	2- 9-31	4¼	5¼	
National Gypsum pfd.	2- 9-31	33½	35½	$1 Jan. 2
Nazareth Cement com.[25]	1-24-31	14		
Nazareth Cement pfd.[25]	1-24-31	97		
Newaygo P. C. 1st 6½'s[27]	2- 9-31	101	102	
New Eng. Lime 1st 6's[14]	2- 6-31	60	70	
N. Y. Trap Rock 1st 6's	2- 9-31	96		
N. Y. Trap Rock 7% pfd.[30]	2- 9-31	95		1.75 qu. Jan. 2
North Amer. Cem. 1st 6½'s	2- 9-31	55	55⅛	
North Amer. Cem. com.[27]	2- 9-31	1½	2	
North Amer. Cem. 7% pfd.[27]	2- 9-31	13		
North Shore Mat. 1st 5's[15]	2-10-31	94		
Northwestern States P. C.[31]	2- 9-31	98	110	$2 Apr. 1
Ohio River Sand com.	2- 9-31		14	
Ohio River Sand 7% pfd.	2- 9-31		98	
Ohio River S. & G. 6's[16]	2- 7-31	90	95	
Oregon P. C. com.[9]	2- 5-31	9	13	
Oregon P. C. pfd.[9]	2- 5-31	80	90	
Pacific CoastAggr. com.[40]	2- 5-31	3	5	
Pacific Coast Aggregates pfd.	2- 9-31	2	4	
Pacific Coast Cement 6's[5]	2- 5-31	65	75	
Pacific P. C., new com.	2- 5-31	12¼		
Pacific P. C., new pfd.	2- 5-31	71	75	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	2- 5-31	97½	99	
Peerless Cement com.[1]	2- 6-31	5⅜	5¾	
Peerless Cement pfd.[1]	2- 6-31	68	75	1.75 Jan. 1
Penn.-Dixie Cement com.	2-10-31	4¼	4⅜	
Penn.-Dixie Cement pfd.	2-10-31	26	30	
Penn.-Dixie Cement 6's	2- 9-31	80	80¾	
Penn. Glass Sand Corp. 6's	2- 4-31	101	103	
Penn. Glass Sand Corp. pfd.	2- 4-31	90		1.75 qu. Jan. 1
Petoskey P. C.	2- 9-31	5½	7	15c qu. Apr. 1
Port Stockton Cem. com.[9]	2- 5-31	No market		
Riverside Cement com.	2- 5-31	10½	12	
Riverside Cement pfd.[9]	2- 5-31	67½	70	1.50 qu. Feb. 1
Riverside Cement, A[20]	1-23-31	10	14	15c qu. Feb. 1
Riverside Cement, B[9]	2- 5-31	1½	2	
Roquemore Gravel 6½'s[17]	2- 7-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	2- 4-31	90	100	
Santa Cruz P. C. com.	2- 5-31	85		$1 qu. Jan. 1 & $2 ex. Dec. 24
Schumacher Wallboard com.	2- 5-31	8	12	
Schumacher Wallboard pfd.	2- 5-31	18	23½	50c qu. Feb. 15
Southwestern P. C. units[35]	2- 5-31	240		
Standard Paving & Mat. (Canada) com.	2- 9-31	14½	14⅝	50c qu. Feb. 16
Standard Paving & Mat. pfd.	2- 9-31		79¾	1.75 qu. Feb. 16
Superior P. C., A	2- 5-31	29½	31½	27½c mo. Mar. 1
Superior P. C., B	2- 5-31	8¾	10	25c qu. Dec. 20
Trinity P. C.units[31]	2- 9-31	104		
Trinity P. C. com.[31]	2- 9-31	32½		
Trinity P. C. pfd.[27]	2- 9-31	107	110	
U. S. Gypsum com.	2- 9-31	42½	43	40c qu. & 50c ex. Dec. 31
U. S. Gypsum pfd.	2- 9-31	121	125	1.75 qu. Dec. 31
Wabash P. C.	1-26-31	20		
Warner Co. com.[16]	2- 7-31	31	32	50c qu. Jan. 15
Warner Co. 1st 7% pfd.[16]	2- 7-31	97	100	1.75 qu. Jan. 1
Warner Co. 1st 6's[8]	2-10-31	94	95	
Whitehall Cem. Mfg. com.[30]	2-9-31	80		
Whitehall Cem. Mfg. pfd.[30]	2- 9-31	50		
Wisconsin L. & C. 1st 6's[15]	2-10-31	94		
Wolverine P. C. com.	2- 9-31		3¾	15c qu. Nov. 15
Yosemite P. C., A com.[9]	2- 5-31	2	2½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]Hemphill, Noyes & Co., New York City. [42]Nesbitt, Thomson & Co., Montreal.

Pennsylvania-Dixie Cement Annual Report

FOR the year ending December 31, 1930, the Pennsylvania-Dixie Cement Corp.'s profits from operations, after depreciation and depletion, and before interest and federal taxes, were $1,361,321, as compared with $1,100,742 for the previous year. Such earnings were more than twice the interest requirements on present outstanding bonds. The net profit available for dividends was $587,461, or $4.32 per share of preferred stock outstanding, as compared with $332,-268, or $2.44 per share in 1929. No dividends were paid during the year on either preferred or common stock.

The balance sheet attached shows current assets equivalent to over 11 times current liabilities, with cash and short-term securities of $3,425,802. Net current assets of $6,119,222 represent an increase of $527,882 over December 31, 1929. During the year the company bought in the open market $821,500 of its bonds. After providing for 1930 sinking fund requirements, there remain in the treasury $1,515,000 of bonds previously drawn down against expenditures for capital improvements and $610,500 of bonds purchased in the market, or a total of $2,125,500 principal amount of bonds.

Plants have been maintained in good physical condition. In addition, depreciation and depletion charges were made against income during the year amounting to $1,379,-289, which is about the same amount as was charged for the same purposes in 1929.

Capital expenditures and improvements made during the year totaled $623,436. Cement storage facilities at the Des Moines, Iowa, plant were practically doubled by the construction of modern reinforced concrete silos and a new packing plant, which will eliminate considerable clinker rehandling cost and permit improved shipping service. Additional mineral deposits were purchased which insure this mill a supply of lower cost raw materials for many years to come. Six new steel barges and a new tug boat were added to the equipment in the sand and gravel division at Chattanooga.

The average sales price realized was somewhat greater than for the previous year. Notwithstanding reduced output, due to decreased sales volume, manufacturing costs

CONSOLIDATED BALANCE SHEET OF THE PENNSYLVANIA-DIXIE CEMENT CORP. AS OF DECEMBER 31, 1930

ASSETS			
Current assets:			
Cash on hand and in banks		$ 3,323,802.62	
Marketable securities		102,000.00	
Notes and accounts receivable:			
Customers, less reserves		404,871.20	
Others		61,414.27	
Inventories at cost or market, whichever is lower, as certified by responsible officials:			
Cement, process stocks, bags, etc.		2,199,019.84	
Machinery parts and supplies		620,088.43	
			$ 6,711,196.36
Fixed assets:			
At reproduction cost, less depreciation, as appraised as of June 30, 1926, plus subsequent net additions at cost:			
Land, mineral reserves, buildings, machinery, equipment, etc.		$35,113,653.49	
Less—Reserves for depletion and depreciation		10,761,220.33	
			24,352,433.16
Investments in affiliated company, etc., at less than cost			346,445.35
Insurance fund and employes' stock purchase account:			
3,900 shares of preferred stock of the corporation, at cost			186,408.79
Deferred charges to future operations			24,606.08
			$31,621,089.74
LIABILITIES			
Current liabilities:			
Accounts payable		$ 119,478.15	
Accrued wages, interest, taxes, etc.		293,537.19	
Reserve for federal income taxes		178,958.99	
			$ 591,974.33
Reserves:			
Special reserve for property betterments and improvements, after charging losses on properties sold and dismantled		$ 17,750.46	
Miscellaneous operating reserves		72,003.22	
Reserve for contingencies		10,000.00	
			99,753.68
First mortgage sinking fund 6% gold bonds, Series A, due Sept. 15, 1941:			
Issued		$14,515,000.00	
Redeemed and cancelled		1,647,000.00	
		$12,868,000.00	
Less—Held in treasury		2,125,500.00	
			10,742,500.00
Capital stock and surplus:			
7% cumulative preferred stock:			
Authorized—200,000 shares of $100 each			
Issued—135,888 shares of $100 each (Series A—convertible)		$13,588,800.00	
Note—Preferred dividends have been paid to Sept. 15, 1929.			
Common stock of no par value:			
Authorized—1,000,000 shares			
Issued—400,000 shares stated at		4,000,000.00	
Surplus, as per statement attached:			
Balance of surplus provided at organization	$2,055,885.77		
Earned surplus	542,175.96	2,598,061.73	
			20,186,861.73
			$31,621,089.74

CONSOLIDATED STATEMENT OF PROFIT AND LOSS AND SURPLUS OF THE PENNSYLVANIA-DIXIE CEMENT CORP. AND SUBSIDIARY COMPANIES FOR THE YEAR ENDING DECEMBER 31, 1930

Net sales		$8,625,170.57
Manufacturing cost of sales (exclusive of depreciation and depletion) and all other expenses of operating, less miscellaneous income		5,884,560.06
		$2,740,610.51
Deduct—Provision for depreciation and depletion		1,379,289.00
Profits from operations		$1,361,321.51
Deduct:		
Interest charges	$ 669,376.42	
Provision for federal income taxes	104,483.60	
		773,860.02
Net profit for the year		$ 587,461.49
Add:		
Surplus balance at January 1, 1930, as per last account	$1,936,158.27	
Profit on purchase of bonds of the corporation, under par	156,622.65	
		2,092,780.92
		$2,680,242.41
Deduct—Amounts transferred to reserve for contingencies, etc.		82,180.68
Surplus at December 31, 1930, per balance sheet		$2,598,061.73

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Portland Cement,[3] 100 shs., par $10	$100 for the lot	....
American Portland Cement,[3] 400 shs., par $10	$400 for the lot	....
American Portland Cement,[3] 100 shs., par $10	$75 for the lot	....
Atlantic Gypsum Products 1st 6s, 1941 ($28,000)[2]	$7400 for the lot	....
Blue Diamond Materials, 10 shs. pfd.[5]	$10 for the lot	....
Florida Portland Cement (Del.),[3] 50 shs. com., no par and 50 pfd.	$450 for the lot	....
Florida Portland Cement, 10 shs. pfd. and 5 shs. com.[6]	$100 for the lot	....
Indiana Limestone, 200 shs. pfd. and 1000 com., no par[4]	$2000 for the lot	....
Rockland and Rockport Lime, 330 shs. pfd., 85 2nd pfd. and 135 com.[10]	$55 for the lot	....
Rockland and Rockport Lime Corp., 50 shs. 1st pfd.[11]	$40 for the lot	....
Standard Rock Asphalt, 1200 shs. no par stock[4]	1¾	....
Tory Hill Sand and Gravel, 13 shs. 8% pfd.[8]	$1 for the lot	....
Tory Hill Sand and Gravel, 13 shs. com., no par[8]	$1 for the lot	....
United Feldspar, 388 shs. pfd., 647 com.[9]	$1000 for the lot	....
Universal Gypsum, 100 trustees cert., no par[7]	$1 for the lot	....
Universal Gypsum, 500 shs. com., no par[9]	$12 for the lot	....
Universal Gypsum and Lime, 300 shs.[1]	$4 for the lot	....
Universal Gypsum and Lime, 200 shs.[1]	$2 for the lot	....
Vulcanite Portland Cement, 300 shs. com., no par[8]	$425 for the lot	....

[1] Price at auction by Adrian H. Muller & Son, New York, August 6, 1930. [2] Price at auction by Adrian H. Muller & Son, New York City, November 19, 1930. [3] Price at auction by Adrian H. Muller & Son, New York City, December 10, 1930. [4] Price at auction, Adrian H. Muller & Son, December 24, 1930. [5] Price at auction, R. L. Day & Co., Boston, December 17, 1930. [6] Price at auction, Barnes &L ofland, Philadelphia, December 17, 1930. [7] Price at auction, A. J. Wright & Co., Buffalo, December 17, 1930. [8] Price at auction, Adrian H. Muller & Son, December 17, 1930. [9] Price at auction, Adrian H. Muller & Son, December 31, 1930. [10] Price at auction, R. L. Day & Co., December 31, 1930. [11] Price at auction, Wise, Hobbs & Arnold, Boston, December 31, 1930.

and average cost of sales were less than in 1929, and the lowest in the company's history. Selling and administrative expenses were substantially reduced during the year, without impairing efficiency.

Accident prevention has been an essential part of the company's operating program for many years with gratifying results. The social and economic benefits of accident prevention work are well recognized. Lost-time accidents at the plants in 1930 were less than in any previous year, and two of the plants, No. 4 at Nazareth, Penn., and No. 7 at Portland Point, N. Y., went through 1930 with 100% performance records, thus winning two of the Portland Cement Association trophies.

The year just passed recorded a continuance of the 1929 decline in building construction. Contracts awarded for all classes of construction in the 37 eastern states, according to F. W. Dodge Corp., were 21% less than the previous year and 32% less than in 1928. Domestic cement consumption in the United States in 1930 was about 11,000,000 bbl. less than the year before and 17,000,000 bbl. less than the peak year of 1928.

The duty of 6 c. per 100 lb. included in the 1930 tariff law affords insufficient protection against foreign cement. Large importations continue. Nearly as much entered the ports of Boston, New York and Philadelphia combined in the first 11 months of this year as in the same period in 1929.

As is true in other industries, the present cement producing capacity of the United States has been expanded far beyond consumption needs. In 1925 the excess of capacity over consumption was 23%, while at the present time it is over 60%. This fact, coupled with the decline in construction work, has intensified competition and brought lower selling prices over the entire market.

Large and accelerated programs of public work by federal, state and municipal authorities to aid employment should go a long ways in offsetting the shortage in private construction. Forecasts made upon this premise indicate that cement requirements in 1931 are likely to equal those of last year.

Compared with previous years, the consolidated balance sheet of Pennsylvania-Dixie Cement Corp. and subsidiaries as of December 31, 1930, is as follows:

COMPARATIVE STATEMENT OF PENNSYLVANIA-DIXIE CEMENT CORP.

ASSETS

	1930	1929	1928	1927
*Land, buildings, machinery and equipment	$24,352.433	$25,140.835	$26,511,046	$26,414,798
Cash	3,323,803	2,987,264	1,573,126	2,949,881
Marketable securities	102,000	....	....	....
Notes and accounts receivable	466.285	686,512	1,365,536	849,015
Inventories	2,819.108	2,602,418	3,394,902	2,964,915
Miscellaneous investments	346,445	372,964	115.600	118,500
Insurance fund	186,409	41,230	35,000	35,000
Deferred charges	24,606	37,782	38,192	37,290
Total	$31,621,089	$31,869,005	$33,033,402	$33,369,399

LIABILITIES

	1930	1929	1928	1927
Preferred stock	$13,588,000	$13,588,800	$13,588,800	$13,000,000
†Common stock	4,000,000	4,000,000	4,000,000	4,000,000
Gold bonds	10,742,500	11,564,000	11,920,000	12,442,000
Accounts payable	119,478	206,449	332,857	194,059
Accrued taxes, interest, etc.	293,537	379,639	414,181	359.872
Dividends declared	....	....	....	200,000
Federal tax reserves	178,959	98,767	283,900	374,746
Other reserves	99.754	95,192	178,200	542,022
Surplus	2,598,061	1,936,158	2,315,464	2,256,700
Total	$31.621.089	$31,869.005	$33,033,402	$33,369,399

*After depreciation and depletion. †Represented by 400,000 no-par shares.

CONSOLIDATED INCOME ACCOUNT FOR YEAR

	1930	1929	1928	1927
Net sales	$8,625,170	$9,610.646	$11,838,443	$12,118,114
Expenditures (less other income)	5,884,560	7,113,989	8,216,275	7,835,252
Balance	$2,740,610	$2,496,657	$3,622,168	$4,282,862
Depreciation and depletion	1,379,289	1,395,916	1,384,785	1,260,622
Interest	669,376	706,175	737,866	747,682
Federal taxes	104,484	62,298	205,666	307,06[illegible]
Net profit	$ 587,461	$ 332,268	$1,293,851	$1,967,493
Preferred dividends	....	711,574	934,120	910,000
Common dividends	....	....	400,000	1,040,000
Surplus	$ 587,461	*$ 379,306	*$ 40,269	$ 17,493
Profit and loss surplus	2,598,061	1,936,158	2,315,464	2,256,700

*Deficit.

STATEMENT OF INTERNATIONAL CEMENT CORP. FOR 1930, BY QUARTERS

	Fourth quarter 1930	Third quarter 1930	Second quarter 1930	First quarter 1930
Gross sales	$7,529,493.43	$9,638,985.49	$9,051,665.56	$7,239,744.50
Less: Packages, discounts, allowances	1,401,178.05	1,863,847.93	1,751,906.80	1,424,843.86
Net sales	$6,128,315.38	$7,775,137.56	$7,299,758.76	$5,814,900.64
Manufact'g cost excluding depreciation	$2,647,659.25	$3,618,327.78	$3,549,047.14	$2,930,576.67
Depreciation	870,745.59	880,634.32	788,907.71	491,037.47
	$3,518,404.84	$4,498,962.10	$4,337,954.85	$3,421,614.14
Manufacturing profit	$2,609,910.54	$3,276,175.46	$2,961,803.91	$2,393,286.50
Shipping, selling, administrative expenses	1,192,082.90	1,276,834.24	1,228,387.27	1,150,865.94
Net profit	$1,417,827.64	$1,999,341.22	$1,733,416.64	$1,242,420.56
Less: Interest charges and financial expenses	166,954.56	187,215.78	187,962.54	192,314.35
	$1,250,873.08	$1,812,125.44	$1,545,454.10	$1,050,106.21
Reserve for federal taxes, contingencies	169,894.42	417,122.45	335,171.63	208,625.58
Net to surplus	$1,080,978.66	$1,395,002.99	$1,210,282.47	$ 841,480.63

International Cement's Fourth Quarter Earnings

THE consolidated profit and loss statement of the International Cement Corp. and subsidiaries, giving results from operations for the fourth quarter of 1930 as compared with the results for the first, second and third quarters of 1930 is as above.

From the above figures which were compiled prior to the receipt of the auditor's final report for the year, it will be noted that the net to surplus for the fourth quarter is $1,080,978.66, which makes a total for the year of $4,527,744.75 after interest on debentures, federal income taxes and all other charges. These earnings are equivalent to approximately $7.12 per share on 635,798 shares of common stock outstanding December 31, 1930.

Dividend on Idaho Preferred

PAYMENT of a six months preferred stock dividend at the rate of 7% by the Idaho Portland Cement Co. at Inkon, Idaho, is announced by President Eugene Enloe.

The distribution will amount to $16,000 on the approximately $450,000 of preferred stock. There are 150 holders, virtually all of whom live in Spokane. It is the second dividend paid by the company, which began operations early in 1929.

Sales of cement during 1930 totaled approximately $165,000, which included a quantity in storage. The mill ran continuously until November 24, when it closed on account of cold weather.

During the past year the company paid for betterments to the plant costing in the neighborhood of $60,000.

Recent Dividends Announced

American Aggregates pfd. (qu.)	$1.75	Feb. 2
Cleveland Quarries Co. (qu.)	0.75	Mar. 1
Cleveland Quarries Co. (extra)	0.25	Mar. 1
Consolidated Sand and Gravel, Ltd., pfd. (qu.)	1.75	Feb. 16
Lehigh Portland Cement pfd. (qu.)	1.75	Apr. 1
Material Service Corp. (qu.)	0.50	Mar. 1
McCrady-Rodgers Co. com.	0.75	Jan. 26
Schumacher Wallboard pfd. (qu.)	0.50	Feb. 15
Standard Pav. and Materials, Ltd., com. (qu.)	0.50	Feb. 16
Standard Pav. and Materials, pfd. (qu.)	1.75	Feb. 16
Superior Portland Cement Cl. A (mo.)	0.27½	Mar. 1

One Gravel Plant Can't Support a Railway—Even a Little One!

THE FATE of the Chicago, Harvard and Geneva Lake electric line is once more in the balance, with the American Sand and Gravel Co. opposing the petition to abandon the line and the electric line officials desirous of selling part of the road to the gravel company.

With the merger of several gravel companies and the probable purchase of the gravel pit at Fontana, the gravel company must have an outlet for its product. If the line from Walworth to Fontana is abandoned the gravel company will have to make a road of its own.

The electric line officials think the solution of the problem is the purchase of that part of the line by the gravel company.

The electric line has not been in operation for several months. That part of the road from Walworth to Harvard has been dismantled completely. The road from Walworth to Fontana, which is less than two miles, is still intact, but not in use.

In May, 1930, the company made application to both the Wisconsin and Illinois state commissions to cease operations. These were granted. Now a petition has come before the Interstate Commerce Commission at Washington, D. C., to suspend service. This latter petition is opposed by the American Sand and Gravel Co. A dispatch says:

"The glorious past and the gloomy present of the little 11-mile Harvard and Geneva Lake railway were before the Interstate Commerce Commission, backing up a petition by the road that it be abandoned.

"President William McKinley of the languishing little line told the commission its officers are unpaid, it is an electric line without wires, and it has scant prospect of competing with the paved road that stretches almost the entire length of its rails.

"The American Sand and Gravel Co. asked that government serum be injected into the veins of the 'system'. Once the company shipped as many as 40 cars of gravel from its Fontana, Wis., plant. The gravel company protested that abandonment would make worthless its $60,000 plant.

"The road once linked the Chicago and North Western, out of Chicago, with the popular Lake Geneva summer resort. Now one can find more Illinois license plates in Lake Geneva than Wisconsin ones, in the summer.

"In 1929, the line lost $20,505, despite the fact that the president, general counsel, and directors drew no pay. The only salaried officer, the active vice-president, collected $3600, Mr. McKinley said, but he also acted as operations manager, division manager, conductor pro tem and station master.

"The Harvard and Geneva Lake railway rolling stock now consists of an electric locomotive, 12 box cars and a freight car."—*Walworth* (Wis.) *Times.*

Oregon Gravel Producer Buys Bankrupt Competitor

THE EUGENE SAND AND GRAVEL CO., Eugene, Ore., has purchased all the A. C. Mathews property sold at sheriff's sale except certain items of personal property. The Eugene Sand and Gravel Co. operates a gravel plant on the Willamette river in the northwestern part of the city. Jack McKey is president and he is associated in the business with H. B. Ruth.

A part of the property owned by Mr. Mathews consists of the gravel plant at the east end of Eighth avenue and several large gravel bars which the Eugene Sand and Gravel Co. acquires. The real property was sold on mortgage foreclosure and the personal property was sold for taxes.

The property sold and the amounts it brought are described as follows:

Real property described as parcels 1, 1a, 1b, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 17 and 19, also rock crusher and fixtures listed in decree for $55,500; parcels 9, 14, 15, 16 and 18, $870; crusher, near the Coburg bridge, $300; work harness, tractor, binder, two wagons, hay rake, baler, plow, harrow, mower, grain drill, on the farm 11 miles west of Eugene, $125; one 10-ton gasoline roller, $450; 78 head of cattle, seven head of horses on the farm, $1935; three trucks, two road sprinklers, four road plows, three teams of horses, six fresnos, four scrapers, four dump wagons, six dump cars at the gravel plant, $1157; one donkey locomotive, three trucks at the plant, $109.50; one gasoline shovel (road grader) $265.

The Feenaughty Machinery Co. bid in a No. 6 Austin gyratory crusher at $250 and one No. 104 Austin crusher, $250.—*Eugene* (Ore.) *Register-Guardian.*

Low Water Permits Early Start

GRAVEL AND SAND dredging boats, usually harbingers of spring, are operating now in the Ohio river. The West Virginia Sand and Gravel Co., of Charleston, W. Va., has resumed operations at Letart Island. The steamer *E. M. Staunton* is towing for this company.

Recently a fleet of sand and gravel boats passed down from St. Marys to begin work at Eight Mile Island at Chelshire.

It is most unusual for a sand and gravel digger to be at work in the Ohio river at this time of the year. Remarkable weather conditions and low river stages have combined to bring out the diggers very early. It is usually the last of March or the first of April before sand diggers begin operations here.

The present winter has been the most unusual on record as far as river conditions are concerned. Not a rise has occurred since last March and it is said that the wharfboat at Gallipolis, Ohio, has not been moved a foot in months, or the position of a line or spar changed.—*Athens* (Ohio) *Messenger.*

The Ohio Gravel Co. Takes Over Cincinnati Plants

SUPPLEMENTING the news item on page 87 of the January 31 issue of Rock Products, the following statement is made regarding the sale of the Cincinnati, Ohio, plants of the American Aggregates Corp., Greenville, Ohio:

"A deal of considerable magnitude, of interest to many Rock Products readers, and representing the sale of properties valued at between two and three million dollars was consummated and ratified recently by the officers and stockholders of American Aggregates Corp., Greenville.

"The deal involved all the gravel properties acquired by the American Aggregates Corp. during the past several years in Cincinnati and immediate vicinity. It included properties acquired from the Ohio Gravel Ballast Co., the Cincinnati Sand and Gravel Co., the Red Bank Co., the T. J. Hall Co., the Acme Sand and Gravel Co. and several lesser properties.

"The purchasers were former stockholders in the various Cincinnati companies which American Aggregates Corp. purchased as above mentioned. These Cincinnati stockholders have formed a coalition and will operate all of the properties of the various former Cincinnati companies as one company, to be known as the Ohio Gravel Co.

"In the sale of the Cincinnati properties of American Aggregates Corp. it is understood that the consideration paid was between two and three million dollars and that it is a very advantageous one from both standpoints of American Aggregates Corp. stockholders and that of the new Ohio Gravel Co.

"The American Aggregates Corp. retains all of its remaining properties and operations in Ohio, Indiana and Michigan and will continue to direct these various interests from its main office at Greenville, Ohio.

"The official organization of the new Ohio Gravel Co. is as follows: F. W. Cornuelle, president and general manager; Earl Zimmerman, vice-president; F. E. Hall, vice-president; W. A. Jurgensen, assistant general manager; Ray Hicks, secretary; H. R. Birchall, treasurer. The directors are: F. W. Cornuelle, Earl Zimmerman, F. E. Hall, Wm. Barber, Harry Donnelly, Ray Hicks and Wm. Reehl."

Contract Awarded for New Illinois Gravel Plant

THE SHERIDAN SAND AND GRAVEL CO., of Ottawa, Ill., is building a gravel washing plant with a capacity of 80 cars daily. The contract has been awarded to the Link Belt Co. of Chicago. The company also is taking bids on a 150-hp. Diesel engine and this award will be made soon. It is reported here that the improvements being installed by the company will cost approximately $10,000.—*Chicago* (Ill.) *Journal of Commerce.*

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Jan. 10	Jan. 17	Jan. 10	Jan. 17
Eastern	1,131	1,012	1,072	1,067
Allegheny	1,305	1,298	1,311	1,396
Pocahontas	119	66	396	406
Southern	239	517	4,780	4,851
Northwestern	166	175	756	967
Central Western	365	391	2,824	2,558
Southwestern	193	322	2,773	2,199
Total	3,518	3,781	13,912	13,444

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

	Limestone Flux		Sand, Stone and Gravel	
	1930	1931	1930	1931
	Period to date		Period to date	
District	Jan. 18	Jan. 17	Jan. 18	Jan. 17
Eastern	5,048	3,041	4,710	3,049
Allegheny	6,154	3,734	6,415	3,745
Pocahontas	592	206	1,428	1,026
Southern	1,533	1,185	16,708	14,133
Northwestern	1,020	573	2,488	2,362
Central Western	1,164	1,115	11,548	8,309
Southwestern	871	551	9,537	7,501
Total	16,382	10,405	52,834	40,125

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	***1931***
Limestone flux	***16,382***	***10,405***
Sand, stone, gravel	***52,834***	***40,125***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of February 7:

SOUTHERN FREIGHT ASSOCIATION DOCKET

53686. **Phosphate rock and limestone, phosphatic**, Rogana, Tenn., to Anniston, Ala. Present rate, combination. Proposed rate on phosphate rock (other than phosphate rock, ground or pulverized, acidulated [acid phosphate], or acidulated and ammoniated), and limestone, phosphatic, straight or mixed carloads, minimum weight 40,000 lb., except when the marked capacity of the car is less, in which case the marked capacity of the car will be the minimum weight, from Rogana, Tenn., to Anniston, Ala., 293c per net ton—same as in effect prior to March 16, 1930, published in L. & N. R. R., I. C. C. No. A-15252.

53687. **Oyster shells**, from Biloxi, Miss., to Ozark and Chadwick, Mo. At present combination rates apply. It is proposed to establish rate on oyster shells, crushed or ground, or not crushed or ground, in carloads, minimum weight 50,000 lb., from Biloxi, Miss., to Ozark and Chadwick, Mo., 36c per 100 lb.—made with relation to rate to Springfield, Mo.

53704 (cancellation). Ganister rock, ground or not ground, from Piedmont, Anniston, Rock Run, Ala., to Fort Payne and Ensley, Ala., and Rome, Ga. It is proposed to cancel, on the obsolete theory, the present rates on ganister rock, ground or not ground, in packages or in bulk, carloads (See Note 1), published in Southern Ry. I. C. C. A-10054, from and to the above named points. Eighth class rates to apply after cancellation.

53705. **Limestone, ground or pulverized**, from Mascot, Tenn., to Boome, N. C. Present rate, $2.67 per net ton; proposed rate on limestone, ground or pulverized, carloads, minimum weight 60,000 lb., from Mascot, Tenn., to Boome, N. C., $2 per net ton.

53707. **Asphaltic limestone**, from Cherokee, Colrock and Margerum, Ala., to Washington, D. C. Present rate, lowest combination; proposed rate on asphaltic limestone, usual description, from Cherokee, Colrock and Margerum, Ala., to Washington, D. C., $4.13 per net ton.

53709. **Agricultural limestone, from Cedar Bluff, Cerulean and Nicholson, Ky., to stations on the L. & N. R. R. in Kentucky. It is proposed to establish rates on agricultural limestone, carloads, from Cedar Bluff, Cerulean and Nicholson, Ky., to stations on the L. & N. R. R. as shown on page 16, I. C. R. R. Tariff 248-I, I. C. C. 7234, on** basis of the Virginia or Docket 19943 Scale.

53712. **Sand and gravel**, from Twohy Siding, Va., to Southern Ry. stations in Virginia. It is proposed to publish rates on sand and gravel, in straight or mixed carloads (See Note 3), on basis of the Trunk Line scale prescribed by the Interstate Commerce Commission in Docket 17517, from Twohy Siding, Va., to Southern Ry., Norfolk Division, stations, Kingmon, Va., to Nelson, Va., inclusive.

53714. **Stone, crushed**, points in Virginia to Southern Ry. stations in Virginia and North Carolina. It is proposed to establish rates on crushed stone, carloads, from Blue Ridge, Roanoke, Rostoco, Alco, Pekin, Miles, Pembroke, Ripplemead, Kerns, Schuleen and Marion, Va., to Southern Ry. stations, Montview, Va., to Danville, Va., inclusive, Danville to Richmond, Va., inclusive, and Danville, Va., to Kingman, Va., inclusive, including stations on Keysville Branch, on basis joint-line scale prescribed by Interstate Commerce Commission in Docket 17517, observing distances figured via Lynchburg, South Boston, Denniston, Burkeville and Suffolk, Va., thence Southern Ry.

> **Note 1—Minimum weight marked capacity of car.**
>
> **Note 2—Minimum weight 90% of marked capacity of car.**
>
> **Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.**

53733. **Gravel**, from St. L.-S. F. Ry. stations, Pacific, Mo., and Valley Park, Mo.; Mo. Pac. R. R. stations, Mountain Ridge, Jedburg, Valley Park, Yeatman, Pacific and Gray's Summit, Mo., to Savannah and Port Wentworth, Ga. Present rate, 445c per net ton. Proposed rate on gravel, carloads, from and to the above named points, 426c per net ton. Proposed rate reflects St. Louis, Mo.-Evansville, Ind., combination.

53734. **Molding sand**, from Ausanba, Ky., to Chattanooga, Tenn. Present rate, 240c per net ton (combination). Proposed rate on molding sand, carloads (See Note 3), from Ausanba, Ky., to Chattanooga, Tenn., 220c per net ton—made in line with rates that have been established between points in southern territory.

53752. **Sand, gravel (washed or unwashed), clay, gravel, crushed stone and slag, etc.**, between stations on the G. S. W. & G. R. R. on the one hand and points in S. F. A. territory on the other. It is proposed to establish the main line or trunk line basis of rates on sand, gravel, clay, gravel, crushed stone, slag, etc., carloads, between G. S. W. & G. R. R. stations on the one hand and stations on other carriers on interstate traffic within the scope of the territory embraced in I. C. C. Docket 17517 and related cases as published in Agent Glenn's I. C. C. A-655.

53773. **Sand and gravel**, from Petersburg, Va., to Southern Ry., Norfolk Division, stations. It is proposed to establish for intrastate application rates on sand and gravel, carloads (See Note 3), from Petersburg, Va., to stations on the Norfolk Division of the Southern Ry., viz.: Nelson to Boydton, inclusive, 125c; Baskerville and Union Level, 115c; Broadnax, Charlie Hope and Lawrenceville, 105c; Edgerton to Drewryville, inclusive, 95c; Capron to Franklin, inclusive, 105c; Lees Mill to Manning, inclusive, 115c; Soroco, 125c; Shoulders Hill to West Norfolk, inclusive, 125c per net ton. Same as recently suggested from Warmere, Va., under Submittal No. 53539.

53598. **Soapstone, refuse, crushed or ground**, from Henry, Va., to Claysburg, Penn. Present rate, 39c per 100 lb. (sixth class), or 874c per ton of 2240 lb. Proposed rate on soapstone, refuse, crushed or ground, in straight or mixed carloads, minimum weight 40,000 lb., from Henry, Va., to Claysburg, Penn., 736c per ton of 2240 lb., adjusted with relation to rates from Hemp and Glendon, N. C.

SOUTHWESTERN FREIGHT BUREAU DOCKET

22010. **Cement**, from points in Alabama, Arkansas, Georgia, Illinois, etc., to Camp Pike and Belmont, Ark. To amend the mileage scale of rates on page 138, S. W. L. Tariff 168A, applying on portland, natural or hydraulic cement, straight or mixed carloads, to provide that same will not apply to Camp Pike and Belmont, Ark. (This will automatically establish rates on basis of Levy, Ark., combination, using rates to Levy, Ark., published in S. W. L. Tariff No. 168A, plus rate of 5c from Levy to Belmont and Camp Pike, published in Mo. Pac. R. R. Tariff No. 6192-I.) Belmont and Camp Pike are on a branch line of the Missouri Pacific, extending north from Levy, Ark. This branch was constructed to serve Camp Pike, a military cantonment during the world war. At that time traffic was heavy, but since the close of the war, movement is light, approximating about three cars monthly. Traffic to and from points on such branch line cannot be handled in switching service, that line not being within switching limits of any station, and it is necessary in order to transport a car of freight to and from a point therein to call a special road crew. At present no specific rates are published in S. W. L. Tariff 168, although the distance scale of rates is applicable. Under the circumstances it is felt that rates on cement should properly be placed on Levy, Ark., combination.

22035. **Chatt**, from Joplin, Mo., to Little Rock and North Little Rock, Ark. To establish rate of 10c per 100 lb. on chatt (mine gravel), whole or crushed, carloads (See Note 3), from Joplin, Mo., to Little Rock and North Little Rock, Ark. The proponent is interested in using chatt in the manufacture of concrete pipe. Crushed stone is now being used and is obtained locally in cross-town switching service. A rate in excess of that proposed will not enable use of chatt in competition with the crushed stone obtained locally. The freight rate, it is stated, is a vital if not controlling factor in this project.

22036. **Lime**, from Arkansas and Missouri points to Winnfield, La. To establish the following rates on lime (calcium), common lime, hydrated, quick or slaked, straight or mixed carloads, minimum weight 30,000 lb., in cents per 100 lb., from Limedale Spur, Ruddells, Johnsons, Ark., Springfield, Mo., Joplin, Mo., and points taking columns 1, 2 and 3 basis of rates in Item 5085A of S. W. L. Tariff 58Q:

Columns	1	2	3
Rates	22½	24	24

Winnfield is intermediate to Alexandria via C. R. I. & P. and L. & A., thereby creating fourth section departures to the extent indicated, as the proposed rates are currently applicable to Alexandria. These departures occur not only at Winnfield but at a good many other points on lines forming routes to Alexandria. The rates on lime in S. W. L. Tariff 58Q are getting in a somewhat complicated condition and it may be found desirable to call a rate check to remove the inconsistencies. This was necessary in connection with rates to Arkansas, Oklahoma and Kansas and other points in individual lines' tariffs where relief was denied. Additionally, the rate from Alabama points is 468c per ton and the Arkansas and Missouri shippers stand to lose the Winnfield business.

22042. **Gravel, crushed stone and sand**, from Picher, Okla., and Hockerville, Kan., to Granby and Kiddo, Mo. To establish a rate of 5c per 100 lb. on gravel, crushed stone and sand, carloads (See Note 1), except when loaded to full visible capacity actual weight but not less than 50,000 lb. will apply from Picher, Okla., and Hockerville, Kan., to Granby and Kiddo, Mo. Shippers at Picher, Okla., and Hockerville, Kan., desire to supply material for road construction near Granby and Kiddo, Mo. In order to enable them to compete with other shippers, it is necessary to publish reasonable rates. It is stated that the proposed basis is nothing more than an extension of the mileage scale shown in Item 6998E, S. W. L. Tariff 44-O.

22074. **Ground limestone**, from Mosher and Ste. Genevieve, Mo., and Valmeyer, Ill., to Three Rivers, Tex. To establish a rate of 21c per 100 lb., to alternate with the present basis, which is 36½c per 100 lb., minimum weight 40,000 lb., on ground limestone (See Note 3), but not less than 40,000 lb., from Mosher and Ste. Genevieve, Mo., and Valmeyer, Ill., to Three Rivers, Tex. It is stated that the movement from these points is in competition

with producing points in the Southwest from which a relatively lower basis of rates applies. For example, the Docket 17000, Part 11, scale applies from points in Arkansas, including Limedale Spur, Ruddells, White Cliffs, Okay and Foreman, at which points there is a production of limestone. The proponent shipper cannot long compete in the Three Rivers market under such a handicap and has appealed to the carriers for an equitable basis of rates. The proposed basis is higher than the 17000, Part 11 scale, being 8½% of the 13535 first-class rates or the basis contended for by the carriers in the present proceedings involving rates from Missouri points to **Texas points.**

22105. **Cement,** from Ada, Okla., to Oklahoma City, Okla. To establish a key point rate of 10c per 100 lb. on cement, hydraulic, portland or natural, straight or mixed carloads, minimum weight 80,000 lb., from Ada, Okla., to Oklahoma City, Okla. It is felt that a market of the character of that of Oklahoma City should have a key-point rate better than the regular scale but on a substantially higher minimum, for the reason that if the present conditions had existed at the time the original Scale III went into effect, undoubtedly the cement plant at Ada would have had a key-point rate as low or lower than the one here proposed.

22131. **Asphalt rock,** from Deerfield, Mo., etc., to points in Missouri. To amend Item 927-A, W. T. L. Tariff 91-F, applying on crushed asphalt rock, by making such item applicable from Deerfield, El Dorado Springs, Ellis, Harwood and Nevada, Mo., also on request from other Missouri producing points which generally take the same rates as these origins.

The rates as named in Item 927-A have been in effect since September 5, 1929, and have placed producers at Deerfield, Ellis, etc., at a disadvantage. Deerfield, Ellis and Iantha are generally subject to the same basis of rates. It is felt that producers at Deerfield, Ellis, etc., should be placed on a competitive basis with Iantha, in so far as Missouri state traffic is concerned.

22139. **Masonry cement,** from New Braunfels, Tex., to Kansas City and Excelsior Springs, Mo. To establish cement scale 3 rates, I. C. C. Docket 8182, which are as shown below, on masonry cement, carloads, minimum weight 50,000 lb., except when the marked capacity of the car used is less, the actual weight but not less than 40,000 lb. will apply, from New Braunfels, Tex., to Kansas City and Excelsior Springs, Mo.: 29½c per 100 lb. to Kansas City, Mo., based on distance of 743.1 miles via M.-K.-T., Dallas, T. & N. O., Denison and M.-K.-T. Lines; 30c per 100 lb. to Excelsior Springs, Mo., based on distance of 781.5 miles via I.-G. N., Georgetown, M.-K.-T., Kansas City, C. M. St. P. & P. It is stated that masonry cement resembles portland cement both chemically and physically and is packed in three-ply multiwall paper bags containing 50 lb. of cement. The present value f.o.b. cars in New Braunfels is $18 per ton, which includes the value of the sacks, and being approximately the value of the portland cement. It will load approximately the same as portland cement.

CENTRAL FREIGHT ASSOCIATION DOCKET

27332. To establish on **crushed stone,** carloads (See Note 3), from Luckey, O., to points in Ohio, rates as shown in Exhibit C attached. Present rates, sixth class.

EXHIBIT C

(To representative points in Ohio)

	Prop.		Prop.
A. C. & Y.		H. V. (C. & O.)	
Akron	125	Rising Sun	70
B. & O.		Upper Sandusky	85
Deshler	85	Morral	90
Mansfield	100	Nor. Ohio R. R.	
Glencoe	155	Plankton	80
Bellaire	165	North Auburn	90
Oil Spring	135	Greenwich	100
Marietta	155	Arlington	95
Shawnee	145	P. R. R.	
Carbondale	155	Marion	95
C. C. C. & St. L.		Upper Sandusky	95
Edison	95	Mt. Vernon	115
Caledonia	95	Coshocton	125
Wharton	85	W. & L. E.	
Adrian	80	Cleveland	125
Green Springs	85	Western Line (N. Y. C.)	
D. T. & I.		Lime City	60
Gallup	90	St. Mary's Br.	
Gerald	100	East Liberty	115
South Solon	125	Western Line	
Erie		Pleasantville	125
Galion	95	Zanesville Br.	
Pavonia	105	Glenford	125
West Salem	115	Cannellsville	
Federal Valley		Cannellsville	145
Lathrop	145	Fultonham Br.	
		Cannon	135

27366. To establish on **dolomite, burnt or roasted,** carloads (See Note 3), from Genoa and Martin, O., to Lima, O., rate of $1.44 per ton of 2000 lb. Present rate, 8¼c (60% of sixth class).

27375. To establish on **crushed stone,** carloads (See Note 3), from North Baltimore, O., to Akron, O., rate of 80c per ton of 2000 lb. for single-line haul of 125 miles. Present rate, 90c per ton of 2000 lb.

27295. To establish on **common sand and gravel,** carloads (See Note 3), from Leeland, Ind., to Union Mills and Haskells, Ind., rate of 92c per net ton. Route—Via B. & O. R. R., Wellsboro, Ind., Grand Trunk Ry. Present, class rates.

27299. To establish on **cement,** common, hydraulic, natural or portland, carloads, minimum weight 50,000 lb., marked capacity of car to govern if less, from Cement City, Mich., to Groves Siding, Ind., rate of 9½c. Route—Via Cincinnati Northern R. R., Latty, O., N. Y. C. & St. L. R. R., New Haven, Ind., and Indiana R. R. System (Ft. Wayne-Lima R. R.). Present rate, combination basis of 9c per 100 lb. from Cement City, Mich., to New Haven, Ind., plus rate of 8c beyond, making through rate of 17c.

27396. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) and **gravel,** carloads (See Note 3), from Winona Lake, Ind., to Kiefersville, O., rate of $1.15 per net ton. Present rate, classification basis (sixth class), 16c, per C. F. A. L. Tariff No. 222, I. C. C. 937.

27449. To establish on **stone, viz.: quarry, waste or tailings,** carloads (See Note 3), from Keeport, Ind., to Gibsonburg, O., rate of $1.20 per net ton of 2000 lb. Route—Via Wabash Ry., Toledo, O., and P. R. R. Present rate, 20½c.

27333. To establish on **crushed stone,** carloads (See Note 3), from Keeport, Ind., to points in Indiana, rates as shown in Exhibit D attached. Present rates, as shown in **Exhibit D attached.**

EXHIBIT D

Crushed stone, carloads, from Keeport, Ind., to points in Indiana. (Rates in cents per ton of 2000 lb.)

To	Pres.	Rte.	To	Pres.	Rte.
Michigan City	*	‡	Chalmers	*	†
Otis	*	‡	Brookston	*	†
Westville	127	‡	Ash Grove	*	†
Alida	127	‡	Battle Ground	*	†
Haskell	127	‡	Dinwiddie	*	‡
Wanatah	127	‡	Range Line	*	‡
So. Wanatah	127	‡	Beech Ridge	*	‡
La Crosse	127	‡	Grape Island	*	‡
Wilders	127	‡	Kersey	*	‡
Farm Siding	127	‡	Zadoc	*	‡
San Pierre	127	‡	Laura	*	‡
Anthonys	127	‡	Gifford	*	‡
Clarks	127	‡	Newland	*	‡
Medaryville	127	‡	Lewistown	*	‡
Francesville	127	‡	Moody	*	‡
Monon	127	‡	Della	*	‡
Reynolds	*	‡	Randle	*	‡
Smithson	*	‡	McCoysburg	*	‡

*Class rates applicable.
‡Via Wabash Ry., Delphi, Ind., and C. I. & L.
†Via Wabash Ry., Lafayette, Ind., and C. I. & L. Ry.

27459. To establish on **crushed stone,** carloads (See Note 3), from Monon, Ind., to stations in the states of Indiana and Michigan (representative stations shown in Exhibit A), rates as shown in Exhibit A attached. Present rates as shown in Exhibit A attached.

EXHIBIT A

From Monon, Ind., to representative points:

B. & O.	Pres.	Prop.
Miller, Ind.	92	80
Alida, Ind.	....	....
G. T.		
Lottaville, Ind.	92	80
Wellsboro, Ind.	92	85
C. & O.		
North Judson, Ind.	92	85
Liberty View, Ind.	77	80
M. C.		
Willow Creek, Ind.	92	80
Grand Beach, Mich.	100	85
N. Y. C. (West)		
Dune Park, Ind.	92	80
Durham, Ind.	90	85
N. Y. C. & St. L.		
Thomaston, Ind.	85	85
La Porte, Ind.	95	85
Pennsylvania		
Runnymeade, Ind.	80	85
Crown Point, Ind.	92	80
P. M.		
New Buffalo, Mich.	95	85
La Porte, Ind.	90	85
Wabash		
Willow Creek, Ind.	90	80
C. & E. (Erie)		
Kouts, Ind.	77	80
Boone Grove, Ind.	77	80
Palmer, Ind.	77	80
Winfield, Ind.	77	80
Crown Point, Ind.	77	80

27464. To establish on **hydrated lime,** carloads, minimum weight 30,000 lb., from Indianapolis (Speedway), Ind., to Peoria and Pekin, Ill., rate of 14½c. Present, 21c (sixth class), minimum weight 30,000 lb.

27467. To establish on **sand** (except blast, engine, foundry, glass, molding or silica) and **gravel,** carloads (See Note 3), from Grayville, Ill., to Vincennes, Ind., rate of 80c per net ton. (On straight shipments of gravel, proposed rate to apply only on shipments in open-top equipment.) Present rate, 12c ($2.40 per net ton), sixth class.

27469. To cancel rate of 54c per net ton on **sand, viz.: blast, engine, foundry, glass, molding or silica,** carloads (See Note 3), as published in C. C. C. & St. L. Ry. Tariff No. 1703-P, from Kern, Ind., to Danville, Hilliary and Danville Jct., Ill., allowing classification basis to apply in lieu thereof.

27470 (cancels W. D. A. 27451). To establish on **crushed stone, rip rap and rubble,** loaded in box car equipment only, carloads (See Note 3), from Milwaukee, Manitowoc, Kewaunee and Menominee, Mich.

To	Pres.	*Prop.
Cleveland, O.	$2.23	$2.40
Columbus, O.	2.50	2.50
Toledo, O.	1.36	1.80
Detroit, Mich.	1.36	1.80
Port Huron, Mich.	1.76	1.95
Bay City, Mich.	2.12	1.80
Mt. Clemens, Mich.	1.76	1.80
Grand Rapids, Mich.	1.36	1.70
Muskegon, Mich.	2.12	1.70
Ypsilanti, Mich.	1.36	1.80
Birmingham, Mich.	1.36	1.80
Flint, Mich.	1.36	1.80
Lansing, Mich.	1.36	1.80
Saginaw, Mich.	2.12	1.80
Big Rapids, Mich.	1.51	1.80
Howard City, Mich.	1.51	1.80
Mayfield, Mich.	1.84	2.00
Walton Junction, Mich.	1.84	2.00

Rates proposed will only be on traffic when originating beyond.

*The rate from Manistique, Mich., to be 10c per ton higher, respectively.

27472. To establish on **slag, crude** (a product of open-hearth blast furnaces), carloads (See Note 3), from Kenova, W. Va., Ironton and Portsmouth, O., to Bettsville, O., rate of $1.50 per ton of 2000 lb. Route—Via N. & W. Ry., Columbus, O., and Penn. R. R. Present rate, 21½c (sixth class).

27473. To establish on **crushed stone,** in bulk (See Note 3), from Albany and Carpenter, Ohio. In cents per ton of 2000 lb.

To	Prop.	Pres.	To	Prop.	Pres.
Corning*	80	80	Kananga*	75	80
Shawnee*	80	90	Gallipolis*	80	80
Hartleyville*	75	80	Point Pleasant†	80	90
Burr Oak*	75	80	Buffalo†	80	105
Palos*	75	80	Woods†	90	115
Glouster*	70	80	Nitro†	90	125
Hunterdon*	75	80	Sattes†	100	125
Jacksonville*	70	80	Charleston†	100	125
Modoc*	75	80	Belle†	110	140
Millfield*	65	70	Levi†	100	125
Chauncey*	65	70	Smithers†	110	140
Armitage*	60	70	Marting†	110	140
Athens*	60	70	Falls View†	110	140
Hibbardsville*	60	70	Glen Ferris†	120	160
Wyesville*	60	70	Gauley Bridge†	120	160
Noble Summit*	60	70	Big Chimney†	100	125
Rockville*	65	70	Elrod†	110	140
Calvin*	65	70	Wills Hollow†	110	140
Hobson*	65	70	Blakeley†	120	160
Hobson Jct.*	65	70	Hitop†	120	160
Pomeroy*	70	80	Swiss†	120	160
Cheshire*	70	80			

*Ohio points. †West Virginia points.

27496. To establish on **limestone, agricultural,** unburned, in bulk, in open-top cars; **stone, crushed,** in bulk, in open-top cars, and **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Delphos, O.

To	Rate	To	Rate
Waldron	$1.07	Cement City	$1.12
Prattville	1.07	Clarks Lake	1.17
Hudson	1.07	Ackerson Lake	1.17
Rollin	1.12	Lyonett	1.17
Manitou Beach	1.12	Jackson	1.17
Addison Jct.	1.12		

27497. To establish on **limestone, agricultural, unburned,** in bulk, in open-top cars; **stone, crushed,** in bulk, in open-top cars, and **stone screenings, in** bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Woodville and Gibsonburg, O., to Saybrook and Conneaut, O., rate of 135c. Present rate, class.

27504. To establish on **crushed stone and crushed stone screenings,** carloads (See Note 3), from Bluffton, Ind. In cents per ton of 2000 lb.

To	Pres.	Prop.
Raber, Ind.	80	75
Peabody, Ind.	80	75
Sidney, Ind.	92	80

Route—Via N. Y. C. & St. L. R. R. direct.

27505. To establish on **sand and gravel,** carloads (See Note 3), from Fairview and Swanville, Penn., to Carl and Van, Penn., rate of $1.20 per net ton. Present rate, sixth class.

27506. To establish on **crushed stone and crushed stone screenings,** carloads (See Note 3), from Waterville, O., to Akron, O., rate of $1.10 per ton of 2000 lb. Route—Via N. Y. C. & St. L. R. R., Holgate, O., and B. & O. R. R. Present rate, sixth class, 18½c.

27376. **To establish** on **lime, agricultural and fluxing, having no commercial value** for chemical or **building purposes,** carloads, minimum weight 30,000 lb., from Huntington and Keeport, Ind., to Ohio destinations, rates based on 80% of the hydrated lime rates, as shown in Exhibit A attached. Present rates as shown in Exhibit A attached.

EXHIBIT A

To (representative Ohio points)	Present rates A	Present rates B	Proposed rates A	Proposed rates B	Routes No.
A. C. & Y.					
Mogadore	16	16	16	13	1, 2, 4, 5, 6
Akron	16	16	16	13	1, 2, 3, 4, 5, 6
Copley	16	16	16	13	1, 2, 4, 5, 6
B. & O. (West)					
Havana	14	14	14	11	7
Sandusky	14	14	14	11	7
Portsmoufth	*16½	*13	*16½	*13	7, 8, 9
	†19	†19	†19	†15	7
Richmondale	19	19	19	15	10
B. & O. (East)					
Wooster	16	16	16	13	7
Myersville	16	16	16	13	7, 11
Girard	17	17	17	13½	7
Justus	16	16	16	13½	7
Bridgeport	22½	22½	22½	18	7
C. & O. (formerly H. V.)					
Lancaster	17	17	17	13½	13
New Straitsville	17	17	17	13½	13
New Plymouth	19	19	19	15	13
Jackson	19	19	19	15	13
D. T. & I.					
Jackson	19	19	19	15	14
Ironton	19	19	19	15	14
Erie					
Ontario	†14	†14	†14	†11	15
West Salem	†16	†16	†16	†13	15
Barberton	†16	†16	†16	†13	15
Aurora	†16	†16	†16	†13	15
Niles	†17	†17	†17	†13½	15
N. Y. C.					
Clyde	14	14	14	11	16
Cleveland	16	16	16	13	16
Amherst	16	16	16	13½	16
Geneva	17	17	17	13½	16
Andover	17	17	17	13½	16
Palmyra	16	16	16	13	17
Sycamore	14	14	14	11	17
Baltimore	17	17	17	13½	17
N. Y. C. & St. L.					
Green Springs	14	14	14	13	18
Lorain	16	16	16	13	18
Madison	17	17	17	13½	18
Conneaut	*22	*22	*22	*18	18
	†22½	†22½	†22½	†18	18
Fremont	14	14	14	11	19
N. & W.					
Sciotoville	19	19	19	15	20
Ironton	19	19	19	15	20
N. O. Ry.					
Litchfield	16	16	16	13	21, 22, 23, 24
Plymouth	14	14	14	13	21, 22, 24
P. R. R.					
Robinson	14	14	14	11	25
Lakeville	16	16	16	13	25
Massillon	16	16	16	13	25
Sandusky	14	14	14	11	26
New Lexington	17	17	17	13½	27, 28
P. & L. E.					
Struthers	17	17	17	13½	29
Lowellville	17	17	17	13½	29
P. & W. Va.					
Hopedale	22½	22½	22½	18	30
Mingo	22½	22½	22½	18	30
W. & L. E.					
Ironville	14	14	14	11	31
Bellevue	14	14	14	11	31
Smithville	16	16	16	13	31
Suffield	16	16	16	13	31
Ellis	17	17	17	13½	31

Description of Routes, via Wabash Ry., Thence

1. Toledo, O., N. Y. C. R. R., Arlington, O., N. O. Ry., Copley Jct., O., and A. C. & Y. Ry. (Applies from Huntington, Ind., only.)
2. Toledo, O., N. Y. C. R. R., Sycamore, O., N. O. Ry., Copley Jct., O., and A. C. & Y. Ry. (Applies from Keeport, Ind., only.)
3. Toledo, O., W. & L. E. Ry., Mogadore, O., and A. C. & Y. Ry.
4. Napoleon, O., D. T. & I. R. R., Columbus Grove, O., N. O. Ry., Copley Jct., O., and A. C. & Y. Ry.
5. Toledo, O., C. C. C. & St. L. Ry. or C. & O. Ry., Carey, O., N. O. Ry., Copley Jct., O., and A. C. & Y. Ry.
6. Toledo, O., W. & L. E. Ry., Spencer, O., N. O. Ry., Copley Jct., O., and A. C. & Y. Ry.
7. Defiance, O., and B. & O. Ry.
8. Cecil, O., C. N. Ry. and B. & O. Ry. (Applies from Huntington, Ind., only.)
9. Toledo, O., C. & O. Ry. and B. & O. R. R. (Applies from Huntington, Ind., only.)
10. Toledo, O., and B. & O. R. R.
11. Toledo, O., W. & L. E. Ry. and B. & O.
12. Toledo, O., N. Y. C. R. R. and B. & O.
13. Toledo, O., and C. & O. Ry.
14. Napoleon, O., and D. T. & I. R. R.
15. Huntington, Ind., and Erie R. R.
16. Toledo, O., and N. Y. C. R. R.
17. Toledo, O., W. & L. E. R. R. and N. Y. C.
18. New Haven, Ind., and N. Y. C. & St. L.
19. Lafayette, Ind., and N. Y. C. & St. L. R. R.
20. Toledo, O., C. & O. Ry., and N. & W. Ry.
21. Napoleon, O., D. T. & I. R. R., Columbus Grove, O., and N. O. Ry.
22. Toledo, O., C. & O. Ry., Carey, O., and N. O. Ry.
23. Toledo, O., W. & L. E. Ry., Spencer, O., and N. O. Ry.
24. Ft. Wayne, Ind., N. Y. C. & St. L. R. R., Bluffton, O., and N. O. Ry.
25. Ft. Wayne, Ind., and P. R. R.
26. Toledo, O., W. & L. E. Ry. and P. R. R.
27. Logansport, Ind., and P. R. R.
28. Toledo, O., C. & O. Ry. or N. Y. C. R. R. and P. R. R.
29. Toledo, O., N. Y. C. R. R.-Erie R. R., and P. & L. E. R. R.
30. Toledo, O., W. & L. E. Ry. and P. & W.Va.
31. Toledo, O., and W. & L. E. Ry.

Explanation of Reference Marks

*Applies from Huntington, Ind., only.

†Applies from Keeport, Ind., only.

A—Applies on lime, common, hydrated, quick or slaked (except agricultural and fluxing lime having no commercial value for chemical or building purposes).

B—Applies on lime, agricultural and fluxing, having no commercial value for chemical or building purposes.

27276. To amend commodity description applying in connection with rates on **crushed stone**, carloads, from East St. Louis, Ill. (applicable only on shipments originating at points in territories described in Note 3, page 107 of C. F. A. L. Tariff No. 400K), to destinations in the states of Pennsylvania, Michigan, Ohio, Indiana, Kentucky, New York, West Virginia, etc., as shown in Items 625 to 739, inclusive, of above-mentioned tariff by eliminating the words "trap rock" therefrom.

*27280. (*Cancels W. D. A. 27038.) To establish on lime, other than agricultural and/or fluxing lime, minimum weight per Official Classification, from Becks, Mitchell, Murdock and Salem, Ind., to Kokomo, Ind., rate of 13c. Route—Via the C. I. & L. Ry., Lafayette, or Linden, Ind., N. Y. C. & St. L. R. R. Present rate, 14c.

27283. To establish on **gravel and sand** (other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica), in open-top equipment, in straight or mixed carloads (See Note 3), from Shore Acres, N. Y., to P. R. R. stations in New York and Pennsylvania, rates as shown below.

To	†Prop.	*Pres.
Dunkirk, N. Y.	90	13½
Sheridan, N. Y.	100	13½
Silver Creek, N. Y.	100	13½
Irving, N. Y.	100	13½
Angola, N. Y.	100	14
Summerdale, N. Y.	80	11½
Panama, N. Y.	90	11½
Clymer, N. Y.	90	11½
Corry, Penn.	100	11½
Elgin, Penn.	100	13
Union City, Penn.	100	13
Waterford, Penn.	110	13
Erie, Penn.	110	13½
Spring Creek, Penn.	100	11½
Garland, Penn.	100	12
Pittsfield, Penn.	100	12
Youngsville, Penn.	110	13
Irvineton, Penn.	110	13
Warren, Penn.	110	13½
Clarendon, Penn.	110	15½
Sheffield, Penn.	120	15½
Ludlow, Penn.	120	15½
Wetmore, Penn.	120	15½
Kane, Penn.	120	15½
Sargeant, Penn.	130	15½
Struthers, Penn.	110	13½
Hemlock, Penn.	110	13½
Big Bend, Penn.	120	13½
Kinzua, Penn.	120	13½
Sugar Run, Penn.	120	14
Gowango, Penn.	120	14
Corydon, Penn.	120	14
Onoville, N. Y.	120	14½
Wolf Run, N. Y.	120	14½
Quaker Bridge, N. Y.	120	15
Althom, Penn.	110	13½
Tidioute, Penn.	110	13½
West Hickory, Penn.	120	14
Spartansburg, Penn.	100	13
Glynden, Penn.	100	13
Centerville, Penn.	100	13
Tyronville, Penn.	100	13
Hydetown, Penn.	110	13
Titusville, Penn.	110	13
Miller Farm, Penn.	110	13½

†In cents per ton of 2000 lb.
*In cents per 100 lb. (sixth class).

27305. To establish on **common sand and gravel**, carloads (See Note 3), from Leeland, Ind., to points in Indiana:

To	Pres.	Prop.	To	Pres.	Prop.
Wawasee	63	50	La Paz Jct.	69	65
Cromwell	63	60	La Paz	69	65
Nappanee	63	60	Avilla	75	65
Kimmell	63	60	Garrett	75	70
Bremen	69	60	Auburn	75	70
Albion	70	60			

27298. To establish on **crushed stone, rip rap and rubble**, carloads (See Note 3), from Milwaukee, Manitowoc, Kewaunee and Menominee, Mich., to points in Ohio and Michigan:

To	Pres.	*Prop.
Cleveland, O.	$2.23	$2.40
Columbus, O.	2.50	2.50
Toledo, O.	1.36	1.80
Detroit, Mich.	1.36	1.80
Port Huron, Mich.	1.76	1.95
Bay City, Mich.	2.12	1.80
Mt. Clemens, Mich.	1.76	1.80
Grand Rapids, Mich.	1.36	1.70
Muskegon, Mich.	2.12	1.70
Ypsilanti, Mich.	1.36	1.80

Rates proposed will only apply on traffic when originating beyond.

*The rate from Manistique, Mich., to be 10c per ton higher, respectively.

TRUNK LINE ASSOCIATION DOCKET

25767. **Sand and gravel**, carloads (See Note 2), from Pinewald, Quail Run and Toms River, N. J., to Beauchamois, Que., 26c per 100 lb. Present rate, 39½c per 100 lb., sixth class. Reason—Rate comparable with others for like distances.

25770. (A) **Building lime**, carloads; (B) **agricultural, land, chemical, gas or glass**, carloads, also **ground limestone**, carloads, minimum weight 30,000 lb. on lime, 50,000 lb. on limestone, from Bainbridge, Penn., to P. R. R. stations, Beaver Meadow, Col., to Beaver Brook, Penn.; Almonsy to Sandy Run, Penn.; Drifton to Deringer, Penn.; Oneida Jct. to McAdoo, Penn.; Buck Mt. Colliery to Mt. Carmel, Penn.; Mid Run to Jenkins Jct., Penn.; Avoca, Penn., and Warriors Run to Wilkes-Barre, Penn. (A) 14c and (B) 13c per 100 lb. Present rates, (A) 15c and (B) 14c per 100 lb. Reason—Rates comparable with rates from contiguous origin points.

25772. **Sand and gravel**, other than blast, engine, foundry, glass, molding or silica, carloads; **crushed stone**, carloads (See Note 3), from Susquehanna, Penn., to stations on the D. L. & W. R. R., Binghamton, Owego, Waverly, Cortland, N. Y., etc. Rates ranging from 90c to $1.30 per net ton.

Reason—Rates comparable with others involving like distances.

25778. **Plaster board,** carloads (see Note A), for mixed carloads with lime and plaster (See Note B), minimum weight 40,000 lb., from Oakfield, N. Y., to Mansfield, Penn., 19½c per 100 lb. (Present rate, combination.) Reason—Rate comparable with rates via other routes.

Note A—Nails, iron or steel, shipped with plaster board, in straight carloads, or with plaster board and other articles in mixed carloads, will be subject to the rate applicable on plaster board, provided the weight of the nails does not exceed 1% of the weight of the plaster board in each car. The quantity of iron or steel nails allowed may be used to make up the minimum carload weight.

Note B—Mixed carloads of lime, plaster and articles taking same rates, and plaster board, will be charged at actual weight and at the applicable carload rate for each of the respective commodities in straight carloads, subject to minimum weight of 40,000 lb. for each mixed carload, deficit in the minimum weight, if any, to be paid for at the rate on plaster, carloads.

25786. **Glass sand,** carloads (See Note 2), from Triplett, Va., to Keyport and Matawan, N. J., $2.80 net ton. Reason—To correct error.

M-1644. **Limestone screenings,** in carloads (See Note 2), from Atlas, Hamburg, Lime Crest and Ogdensburg, N. J., to P. R. R. stations, Trenton, N. J., Morrisville, Penn., $1.77; Riverside, N. J., $1.88; Camden, N. J., $2, and Gloucester, Moorestown, Maple Shade and Merchantsville, N. J., $2.05 per net ton. Reason—Rates comparable with others involving similar hauls.

M-1648. To establish rate of $4.20 per net ton on **ground feldspar,** carloads, minimum weight 60,000 lb., from Brookneal, Va., and rate of $3.80 per net ton on **crude feldspar,** carloads (See Note 2), from Bedford, Forest and Goode, Cullen, Altavista, Leesville, Huddleston, Stone Mountain, Moneta, Meador, Goodview, Stewartsville and Hardy, Va., to Trenton, N. J. Reason—Rates comparable with others involving like distances.

25788. **Cement, common, hydraulic, natural or portland,** carloads, minimum weight 50,000 lb., from all trunk line and border C. F. A. producing points coming within the scope of the cement adjustment effective February 1, 1929, to stations on the new extension of the Bellefonte Central R. R. (Potato Lodge to Eyer, Penn.), both inclusive, same rates as now in effect to Struble, Penn. (B. C. R. R.), or rates now in effect to Tyrone, Penn. (P. R. R.), using either Struble or Tyrone, Penn., as a basis, whichever produces the highest rate.

Sup. 1 to 25663. Amend Rate Proposal 25663, **cement, magnesite, high temperature bonding cement,** carloads, minimum weight 60,000 lb., from Plymouth Meeting, Penn., to various points in Arizona and Mexico, by adding Perth Amboy district as origin territory on basis of same rates as proposed from Plymouth Meeting, Penn.

25794. **Crushed stone, coated with oil, tar or asphaltum,** carloads (See Note 2), from Lancaster, Penn., to Morristown, N. J., $2.05 per net ton; present rate, sixth class. Reason—Proposed rate is comparable with rate from Monocacy, Penn., to Chester, Lafayette and Branchville, N. J.

25795. (A) **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Narvon and Honeybrook, Penn., to York Haven, Penn., (A) $1.05 and (B) $1.17 per net ton; present rate, sixth class. Reason—Proposed rates are comparable with rates to Harrisburg, York and Myers Mill, Penn.

25804. **Gravel and sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Highspire, Penn., to Pennsylvania points (rates in cents per net ton of 2000 lb.):

To	Prop.	To	Prop.
Harrisburg	65	Elizabethtown	75
Duncannon	75	Mt. Joy	75
Newport	85	Lancaster	85
Mifflin	105	Lebanon	85
Lewistown	120	Mechanicsburg	75
Huntingdon	145	Dillsburg	80
Tyrone	155	Carlisle	80
Altoona	165	Newville	85
Dauphin	75	Shippensburg	90
Halifax	80	Chambersburg	120
Millersburg	90	Waynesboro	120
Lykens	90	Hagerstown	130
Williamstown	105	New Cumberland	70
Sunbury	105	York Haven	80
Milton	120	York	85
Columbia	80		

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

25809. **Ganister rock,** carloads (See Note 2), from Sykesville, Md., to Niagara Falls, N. Y., $2.50 per net ton. (Present rate, 27½c per 100 lb., sixth class.) Reason—Proposed rate is comparable with rate from Berkeley Springs, W. Va.

M-1654. To revise rates on **cement,** carloads, from Trunk Line territory, including New Castle district, to points on the Washington and Old Dominion Ry., as follows: Alexandria, Va., Hume, Va., Barcroft, Va., Glencarlyn, Va., Lacey, Va., Douglas, Va., Thrifton, Va., the rates to be made the same as the rate to Rosslyn, Va., in connection with the Rosslyn connecting railroad.

Torrison, Va., to Bluemont, Va. Rates to be based 2c higher than I. C. C. Docket 15806 scale.

Great Falls, Va. Rates to be made 8c per 100 lb. in excess of the rate to Potomac Yard, subject to carload minimum weight of 33,000 lb.

25826. **Feldspar,** carloads (See Note 2), from Bedford Hills, N. Y., to Sheffield, Penn., 22½c per 100 lb. Present rate, 30½c per 100 lb., sixth class. Reason—Proposed rate is comparable with rate to Brockway, Port Allegany, Penn., etc.

25829. **Sand,** in open-top equipment, in box cars or other closed equipment, carloads (See Note 2), from Raritan River R. R. stations to Walden, N. Y., $3.10 per net ton when in open-top equipment and $3.42 per net ton when in box cars or other closed equipment. Reason—Proposed rate is comparable with rate from Pasadena, Greenwich, N. J., etc.

25830. **Gravel and sand** (other than blast, engine, fire, foundry, glass, molding or silica), carloads (See Note 2), from Mt. Bethel, Portland and Stier, Penn., to Tannersville, Pocono Summit, Penn., $1, and Pocono Lake and Wagners Switch, Penn., $1.10 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

25831. **Crushed stone,** carloads (See Note 2), from Union Stone Co., Bainbridge and Billmeyer, Penn., to Springvale to Broguesville, Penn., inclusive, $1.10, and Laurel, Penn., to Pylesville, Md., inclusive, $1.15 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

25833. To add to Reading Company Tariffs I. C. C. Nos. 6, 8, 861, 864, 875, 890, 891, 892, 1009, J8664 and J8768, applying on **lime** (building, hydrated building, land, chemical and hydrated chemical), carloads, minimum weight 30,000 lb., and **limestone** (finely ground), carloads, minimum weight 50,000 lb., to points in Trunk Line territory: "Exton, Penn., as a point of origin, taking the same rates and minimum carload weights as applicable from Mill Lane, Penn."

25844. **Sand,** N. O. I. B. N., in open cars, carloads (See Note 2), from Lewes, Del.

To	Prop.	To	Prop.
Amherst, N.S.	41	Ottawa, Ont.	26½
Cambellton, N.B.	41	Quebec, Que.	33½
Chatham, N.B.	41	Sackville, N.B.	41
Cornwall, Ont.	26½	St.Hyacinthe, Que.	29
Dalhousie, N.B.	41	St.Johns, Que.	26
Danville, Que.	29	St.John, N.B.	41
Fredericton, N.B.	41	St.Lambert, Que.	26
Halifax, N.S.	41	Shawinigan Falls, Que.	33½
Hull, Que.	26½	Sherbrooke, Que.	26½
Joliette, Que.	33½	Sorel, Que.	30
Londonderry, N.S.	41	Sydney, N.S.	50
Longueiul, Que.	26½	Sydney Mines, N.S.	50
Moncton, N.B.	41	Three Rivers, Que.	33½
Montmagny, Que.	39	Truro, N.S.	41
New Glasgow, N.S.	41		
No. Sydney, N.S.	50		

Proposed rates in cents per 100 lb.

Reason—Proposed rates are fairly comparable with rates from Cape May, N. J.

25767, Sup. 1. **Sand and gravel,** carloads (See Note 2), from points on the Atlantic City Division of the Reading Co. to Beaucharnois, Que., 26c per 100 lb.

25857. **Gravel and sand** (other than blast, engine, fire, foundry, glass, molding or silica), carloads (See Note 2), from Mt. Bethel, Portland and Stier, Penn., to Pennsylvania points on the Reading Co. as follows:

To	Prop.	To	Prop.
Catawissa	145	Lykens	150
Shamokin	140	Pine Grove	140
Glen Dower	135	Lebanon	145
Pottsville	125	Pottstown	140
Shenandoah	130		

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

25860. **Limestone, unburnt, ground or pulverized,** carloads, minimum weight 50,000 lb., from Millville, W. Va., Natural Lime Marl Co. Siding, W. Va., Charlestown, W. Va., Alba Marl Lime Co., W. Va., Stephens City, Va., Cedar Creek, Va., Capon Road, Va., Oranda, Va., Vaucluse, Va., Strasburg Jct., Va., and Strasburg, Va., to Bridgeton, N. J., 14½c per 100 lb. Present rate, 15½c per 100 lb. Reason—Proposed rate is comparable with rates from Bellefonte and Pleasant Gap, Penn.

25862. **Sand and gravel,** other than blast, engine, foundry, glass, molding or silica, carloads (See Note 2), from Alfred, N. Y., to stations on the P. S. & N. Ry., Wayland, Stony Brook Glen, Webbs, N. Y., West Eldred, Kasson, North Fork, Penn., Kaulmont, Penn., and various. Rates ranging from 80c to $1.40 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

25396. To amend proposal No. 25396 covering **sand, blast** (will not apply to points in Canada); **common, engine** (will not apply to points in Canada); **glass, molding, quartz, silica, silex, flint, ground and rock ganister,** carloads, from Berkeley Springs, etc., to East Sparta, O., by adding as origin points Granville, Horningford, Huntingdon, McVeytown, Mapleton, Mill Creek, Newton, Hamilton, Ryde and Vineyard, Penn., at same rates as proposed from Berkeley Springs, etc.

25873. **Stone, ganister,** carloads (See Note 2), from Mount Union to Monessen, Penn., $1.51 per net ton. (Present rate, 25½c per 100 lb., sixth class.) Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

25874. **Sand and gravel,** carloads (a) in open-top equipment, (b) in box cars or other closed equipment (See Note 2), from Raritan River R. R. stations, McDonoughs, N. J., to New Brunswick, N. J., inclusive, to Coatesville, Penn.: (a) $1.65, (b) $1.90 per net ton, and to Steelton, Penn., (a) $2.20, and (b) $2.40 per net ton. Reason—Proposed rates are comparable with rates from Mauricetown, Bivalve, N. J., etc.

25880. **Gravel and sand** (other than blast, engine, fire, glass, molding or foundry, quartz, silex and silica), carloads (See Note 2), from Port Covington (Baltimore), Md., to Glen Morris, Md., 70c per net ton. (Present rate, 90c per net ton.) Reason—To meet motor truck competition.

25890. **Gravel and sand,** other than blast, engine, foundry, molding, glass, silica, quartz and silex, carloads (See Note 2), from Baltimore and Patapsco, Md., to Parkton, Md., 70c per net ton. (Present rate, 90c per net ton.) Reason—To meet motor truck competition.

25767. To establish rates on **sand and gravel,** carloads (See Note 2), from Metuchen, N. J., to Maurer, N. J., inclusive, to Beauharnois, Que., 24c per 100 lb., and from P. R. R. shipping points, Jersey City, Perth Amboy, Riverside, Toms River, Bridgeton, Menantico, Cape May, N. J., Philadelphia stations, Harrisburg stations, Penn., Wilmington stations, Newport, Delaware, Northeast, Conowingo, Baltimore stations, Md., and various, to Beauharnois, Que., rates ranging from 24c to 26c per 100 lb. Reason—The proposed rates are same as in effect to Montreal, Que.

25916. **Gravel and sand,** other than blast, core, engine, fire, glass, grinding, molding, quartz, silex or silica; **slag** (product of iron or steel blast or open-hearth furnaces), not ground or pulverized, in bulk, in open-top equipment; **screenings, crushed stone; stone, crushed; tailings, crushed stone,** carloads (See Note 2), from Buffalo, N. Y., to Springville, N. Y., 70c per net ton. (Present rate, 83c per net ton.) Reason—To meet motor truck competition.

25933. **Sand, common and engine,** carloads (See Note 3), from Lewes, Del., to points of destination in Canada as provided in Agent Curlett's I. C. C. A265. (Proposed rate, Philadelphia rate basis plus 2c per 100 lb. Present rate, Philadelphia rate basis plus 6c per 100 lb., with minimum of 33½c per 100 lb.) Reason—Proposed rates are comparable with rates to points in C. F. A. territory and are also comparable with rates from South Jersey points to Canadian destinations.

M-1660. **Crushed stone and screenings,** carloads (See Note 1), from Security, Md., to Park Head, Md., 70c per net ton. Present rate, 80c per net ton. Reason—To meet motor truck competition.

25939. **Sand, blast, engine, foundry, glass, molding or silica,** carloads (See Note 2), from Cascade and Sturgisson, W. Va., to Fairmont, W. Va., $1 per net ton. (Present rate, $1.20 per net ton.) Reason—Proposed rate is comparable with rate from Greer, W. Va.

25940. **Crushed stone,** carloads (See Note 2), from Havre-de-Grace, Md., to Philadelphia, Penn., 90c per net ton. (Present rate, $1.05 per net ton.) Reason—Proposed rate is comparable with rate to Contee, Dickerson, Md., and Washington, D. C.

25949. (A) **Sand, in open-top cars,** carloads, and (B) **sand, in box cars or closed equipment** (See Note 2), to Elkton, Md.

From	Proposed (A)	Proposed (B)	Present (A)	Present (B)
Group 1 So. Jersey	185	210	205	230
Group 2 So. Jersey	200	220	220	240
Toms River, N. J.	190	215	210	235

Reason—Proposed rates are comparable with rates to Wilmington, Del.

25951. **Sand, molding,** carloads (See Note 2), from Harrisburg, Penn., to Reading Co. stations, Phoenixville, Pottsville, Mt. Carmel, Catasauqua, Shamokin, Quakertown, Williamsport, Middletown, Myerstown, Temple, Landisville, Lancaster, Penn., Wilmington, Del., and various, rates ranging from 90c to $1.80 per net ton. Reason—Proposed rates are comparable with rates on like commodities, for like distances, services and conditions.

WESTERN TRUNK LINE DOCKET

5645-B. **Cement, lime, plaster and stucco,** in mixed carloads, from Rapid City, S. D., to destinations in Nebraska. Rates: Present—Item 565A, W. T. L. Tariff 207, reads: "Apply on the cement the carload rate at actual but not less than 50,000 lb., and on the lime, plaster and/or stucco, actual weight on each subject on the straight carload rate applicable to each." Proposed—To include in Item 105 of W. T. L. Tariff 133G, from Rapid City,

S. D., to points in Nebraska, the following rule: "Apply on the cement the carload cement rate at actual weight, but not less than 50,000 lb., and on the lime, plaster and/or stucco, actual weight, a rate of 3c per 100 lb. higher than the rate charged on the cement."

5339-B. **Sand (glass)**, carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Klondike, Mo., to Alton, Ill. Present rate, 97c per ton of 2000 lb., published in M.-K.-T. Tariff 3074L, I. C. C. A5023; proposed, 90c per ton of 2000 lb.

7506. **Stone, crushed, asphalt coated,** carloads, as described in Item No. 1050-C of Mo. Pac. Tariff No. 6172-E and Item No. 926-C of W. T. L. Tariff No. 91-F, from Blackwater, Mo., to stations in Missouri. Present rates, class E; proposed, publish from Blackwater, Mo., to points in Missouri the single-line mileage rates as shown in Item No. 1050-C of Mo. Pac. Tariff No. 6172-E and the joint-line mileage rates as shown in Item No. 926-C of W. T. L. Tariff No. 91-F.

3238-E. **Slag, granulated,** carloads (See Note 2), from South Chicago, Ill., and Gary, Ind., to Steelton, Minn. Present rate, $2.80; proposed, $1.65 per gross ton. (Rate to expire 90 days after same becomes effective.)

2051-OO, Sup. 1. **Stone, crushed,** carloads, from Jasper, Pipestone, Quartzite, Minn., Dell Rapids and Sioux Falls, S. D., to Clinton, Ia. Present rate, 12c; proposed, 11c per 100 lb.

7507. **Cement blocks or slabs,** concrete, artificial stone, when not braced, wedged or packed for protection against rubbing, breaking or chipping. From Prairie du Chien, Wis., to stations on the C. M. St. P. & P. R. R. in Iowa and Minnesota located within 150 miles of Prairie du Chien, Wis. Present rates, brick rates as named in W. T. L. Tariffs 5N and 50N; proposed, the following distance scale to alternate with the present brick rates:

Miles	Rates	Miles	Rates
5	4c	80	8½
10	5	100	9
20	5½	120	9½
40	6½	140	10
60	7	150	11
70	8		

7514. **Stone, broken, crushed or ground,** carloads (See Note 3), but not less than 40,000 lb., from Liberal, Mo., to representative points.

To	Prop.	To	Prop.
Blair, Kan.	200	Fremont, Neb.	260
Fairbury, Neb.	250	Norfolk, Neb.	300
Hastings, Neb.	270	Lawrence, Kan.	140
Grand Island, Neb.	280	Manhattan, Kan.	200
Omaha, Neb.	210	Salina, Kan.	210

At present no through rates are in effect; combination applies. (Complete copy of exhibit will be furnished on request.)

6988-A. **Lime,** carloads, as described in Items 5220 and 5230 series, W. T. L. Tariff 111-G, and Item 5080 series, W. T. L. Tariff 120-D. From (a) Beardstown and Carbon Cliff, Ill., (b) Beardstown, Ill., to (a) Colorado common points, (b) Utah common points. Rates from Beardstown, Ill., minimum weight 30,000 lb., to Colorado common points, present 33½c, proposed 34½c; also minimum weight 40,000 lb., present 27½c, proposed 28½c. From Beardstown, Ill., to Utah common points, minimum weight 40,000 lb., present 60c, proposed 61c. From Carbon Cliff, Ill., to Colorado common points, minimum weight 40,000 lb., present 27½c, proposed 28½c.

7517. **Cement,** from Speeds, Ind., to all points in Iowa and Missouri, also Missouri River points, Kansas City, Mo., to Sioux City, Ia. Present rates, class or combination; proposed, I. C. C. Docket 8182 scale.

6729-A. **Sand,** carloads, description and minimum weight as provided in W. T. L. Tariff 18M, Item 4265A, from Chippewa Falls, Wis., to Independence, Mo. Present rate, 31c per 100 lb. (Class E); proposed, 16c per 100 lb.

6729-B. **Sand, carloads,** as described in W.T.L. Tariff 18M, Item 6000A, from Chippewa Falls, Wis., to destinations in Kansas and Missouri shown in Item 6000A, W. T. L. Tariff 18M. Present rate, 26c; proposed, 22c.

6952-A. **Stone, crushed,** carloads, from Illinois producing points to stations in Iowa. Present rates, various. Proposed, I. C. C. 21755 sand and gravel scale. Minimum weight: present, various; proposed, marked capacity of car.

7129-A. **Rock, crushed asphalt,** carloads (See Note 1), except when cars are loaded to full visible carrying capacity, in which event actual weight will govern, from Deerfield, El Dorado Springs, Ellis, Harwood and Nevada, Mo., also on request from other Missouri producing points which generally take the same rates as these origins, to points in Missouri named in Item 927A, W. T. L. Tariff 91F. Present rates, Class D; proposed, to amend Item 927A, W. T. L. Tariff 91F, by making such item applicable from points specified above.

3545-S. **Sand and gravel,** carloads, as described in W. T. L. Tariff 156S, from Bonner Springs, Choteau, Forrest Lake, Frisbie, Sunflower and Wilder, Kan., to all industrial and team tracks within Kansas City, Mo.-Kan., switching district as described in W. T. L. Tariff 156S. Present rate, 3½c; proposed, 3c per 100 lb.

2898-I. **Sand and gravel,** carloads (See Note 3). In no case shall the minimum weight be less than 40,000 lb. Between points in Iowa and points in Minnesota. Rates: Present—Various. Proposed—In cents per ton of 2000 lb.

Distance—	Single line	Joint line
Under 40 miles	75	90
50 miles and over 40	80	95
60 miles and over 50	85	100
70 miles and over 60	90	105
80 miles and over 70	95	110
90 miles and over 80	100	115
100 miles and over 90	105	120
110 miles and over 100	110	125
120 miles and over 110	115	130
130 miles and over 120	120	135
140 miles and over 130	125	140
150 miles and over 140	130	145
160 miles and over 150	135	145
170 miles and over 160	140	150
185 miles and over 170	145	155
200 miles and over 185	150	160
230 miles and over 200	155	165
260 miles and over 230	165	175
290 miles and over 260	175	185
320 miles and over 290	185	195
350 miles and over 320	195	200

ILLINOIS FREIGHT ASSOCIATION DOCKET

6007 (1). **Sand,** except blast, engine, foundry, glass, molding or silica, **and gravel,** in straight or mixed carloads (See Note 3), from Mt. Carmel, Ill., to Marshall, Ill. Present rate, 14c per 100 lb.; proposed, 85c per net ton. (1) On mixed shipments of sand and gravel, or straight shipments of gravel, proposed rate to apply only on shipments in open-top equipment.

3093. **Molding sand,** carloads (See Note 2), from Galena and Portage, Ill., to Belvidere, Ill.. Present rate, class; proposed, $1.56 per ton of 2000 lb.

4104. **Stone, crushed,** carloads (See Note 1), to Glen Carbon, Mont., Alhambra, Binney and Mt. Olive, Ill.

From	Pres.	Prop.
Krause-Stolle	76	63
Falling Springs	86	73

4148. **Stone, viz.: stone, ground or pulverized, crushed or rough quarried,** in straight or mixed carloads (See Note 3), but not less than 40,000 lb., from Valmeyer, Ill., to N. Y. C. & St. L. R. R. stations, Kingman, Ill., to Charleston, Ill., inclusive. Present rate, $1.29; proposed, $1.21.

5924-A. **Sand and gravel** (except blast, engine, foundry, etc.), carloads (See Note 3), from Golconda, Ill., to Mt. Vernon, Ill. Present rate, combination; proposed, $1 via I. C. R. R., Tamaroa, Mo. Pac., 120 miles; $1.20 via I. C. R. R., Centralia, Southern, 128 miles; $1.13 via I. C. R. R., Ashley, L. & N., 148 miles; $1 via I. C. R. R., Marion, C. & E. I., 92 miles.

6025. **Lime,** carloads, minimum weight 60,000 lb., common, viz., crushed, hydrated, lump, pulverized, lime mortar, in straight or mixed carloads, from East St. Louis, Ill., to Decatur and Springfield, Ill. Present rate, 10½c; proposed, 8c.

6031. **Sand and gravel,** carloads (See Note 1), from Moronts, Ill., to A. T. & S. F. Ry. stations to representative points in Illinois:

To	Prop.	To	Prop.
Coal City	$1.20	North Hampton	1.30
Mazon	1.00	Long Point	1.01
Moon	.95	Benson	1.13
La Rose	1.20		

No rates to these points at present.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

21689. **Screened gravel** (See Note 3), from North Wilbraham, Mass., to Athol, Mass. Present rate, $1.05; proposed, 90c per net ton. Reason—To equalize rates from shipping points on road-building material mentioned herein.

I. C. C. Decision

22261. Road Material Scale. A thousand-mile scale to be used in the making of rates on coated road materials within southern territory has been prescribed in No. 22261, Interstate Amiesite Co. et al. vs. A. & R. et al., the Interstate Commerce Commission, by division 2, in a report written by Chairman Brainerd, having found the present rates unreasonable. New rates are to be established not later than April 28. Specifically, the commission found unreasonable the rates on crushed stone or slag, mixed and coated with asphaltum and lime, from Smyth, N. C., Atlanta, Ga., Birmingham, Ala., and High Bridge, Ky., and on sand, gravel and chert, mixed and coated with asphaltum, oil or tar, from Ormewood, Ga., to destinations in southern territory.

In fourth section order No. 10527, road building materials in southern territory, the carriers have been given fourth section relief on two of the three points mentioned in their applications. The third form of relief requested pertained only to the desire of the Carolina railroad to establish the same rates to Snow Hill, N. C., as were in effect contemporaneously to Maury, N. C., on the East Carolina railroad, and maintain higher rates at intermediate points. No evidence was offered in support of that point, hence the denial of relief.

The relief granted, however, was without making it subject to the equidistant limitation of the fourth section. Therefore Commissioner Lee concurred in the grant of relief except in respect of the equidistant feature. The relief permits grouping such as the commission permitted in Rates on Lumber and Other Forest Products, 165 I. C. C. 561.

Complainants, the report said, asked for rates on the basis of the scale prescribed in Rates on Chert, Clay, Sand and Gravel, 122 I. C. C. 133, and 140 I. C. C. 85, inflated to give recognition to the fact that the coated road building materials involved were of greater value than the primary materials for which that scale was prescribed. Their proposal would have resulted in a scale beginning with 55 cents a net ton for single-line hauls for five miles and less and 70 cents for joint-line hauls. The scale prescribed begins with 75 cents for single-line and 95 cents for joint-line hauls. In the block between 80 and 85 miles the difference in rates between single-line and joint-line hauls disappears, the rate for that block and for the blocks up to 100 miles becomes 160 cents. The rate at 200 miles becomes 200 cents; at 300 miles, 230 cents; at 400 miles, 260 cents; at 500 miles, 310 cents; at 600 miles, 330 cents; at 700 miles, 380 cents; at 800 miles, 400 cents; for the block between 880 and 910 miles, 430 cents, and for the block between 970 and 1000 miles, 450 cents.

The scale applies for that part of southern territory outside of the Florida peninsula. For hauls within that peninsula arbitraries are to be added. The arbitrary scale begins with 30 cents for 30 miles or less; becomes 50 cents for the block between 60 and 100 miles; 70 cents for the block between 150 and 200 miles; 85 cents for the block between 250 and 300 miles; 90 cents for the block between 300 and 350 miles, and runs out with an arbitrary of 95 cents for distances greater than 350 miles.

Rates on Sand and Gravel Into Milwaukee, Wis.

RATES ON RAIL SHIPMENTS of sand and gravel into Milwaukee, Wis., will be reduced 25% by the railroad commission, following a hearing on the question at Madison, Wis., recently.

The Northwestern and Milwaukee roads, as well as proprietors who ship sand and gravel into Milwaukee from a number of points, were in favor of the reduction.

The opposition came from those shipping sand and gravel between intermediary points and who are not included in the reduction.

The commission at the close of its hearing indicated that it would approve the rate reduction, but that it would entertain any complaints as to discrimination after the rates were in effect.

The reduction in rates is another one of the moves by the railroads to meet truck competition.—*Milwaukee* (Wis.) *Sentinel.*

Sand-Lime Brick Manufacturers Discuss Products and Costs

Atlanta, Ga., Convention of Association

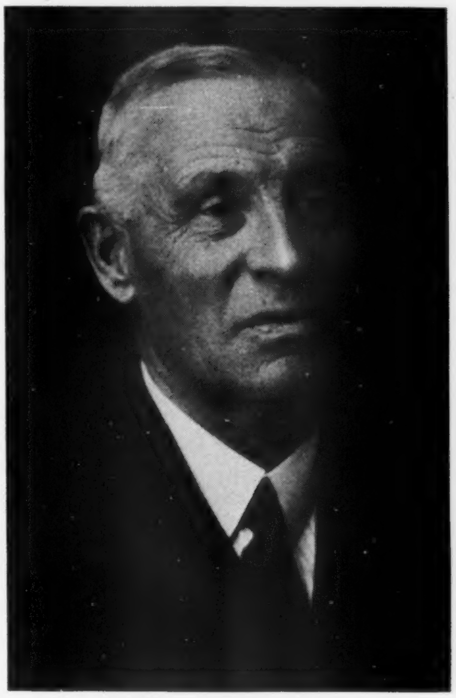
THE 27TH ANNUAL CONVENTION of the Sand-Lime Brick Association was held at the Hotel Ansley, Atlanta, Ga., on February 3, 4 and 5, and though the meeting was comparatively small numerically, many excellent papers of interest to the industry were presented.

The sand-lime brick industry, even though a small industry, maintains an active association under adverse conditions, and it is apparent that much good is being done by supplying its members information on improvements in practice that will enable them to produce a better and more uniform brick at a lower cost.

The first afternoon session was opened by **President Allen G. Walton** presiding, and brief reports of the secretary, treasurer and of the several standing committees were presented, following which **Prof. Thomas R. Lawson,** head of the department of civil engineering, Rensselaer Polytechnic Institute, Troy, N. Y., gave an excellent talk on "Reinforced-Brick Masonry." He showed slides illustrating several methods that had been used for applying the principles of reinforcements to ordinary brick construction. These in essence consisted of imbedding in the mortar reinforcing bars of various sizes ranging from ¼-in. diameter upwards, with square, ⅜-in. bars being a very satisfactory size.

In the experimental tests that Prof. Lawson conducted, which were the basis of his talk, various types of beams were constructed and subjected to live loads until the beams ruptured. From the data he gave, there was a large gain in strengths, ranging from 20 to 25 times the load-carrying capacity of unreinforced beams. To illustrate, he showed reinforced brick beam having a 10-ft. span made up of four courses of brick (in height) and one course wide. This beam sheared at loads of 650 lb. per sq. ft., whereas unreinforced beams stood less than 25 lb. per sq. ft. He pointed out that the strength of the mortar was a very important factor and that a mortar should be used that had a low shrinkage value. The location of the reinforcing bar was also important and in the tests shown the bars were laid in the mortar well toward the bottom of each course. He brought out the importance of determining the best mortar for the types of brick in use.

In the discussion **J. Morley Zander** stated that he had been using wire cloth reinforcement for brick silo construction for about 15 years with very satisfactory results. **Irving G. Toepfer** asked what influence the different types of brick had, with particular regard to roughened or smooth type of face. To which it was answered that no doubt the rougher faces would show the higher result, all other things being equal.



John L. Jackson, elected president

Following Prof. Lawson's talk, the activities of Committee C-3 on brick of the A. S. T. M. were discussed by the president, Allen G. Walton, and on motion of Chester Carmichael, the report of the committee was accepted.

Research and Advertising

The next order of business was the report regarding what had been done on research and advertising, as planned at last year's convention. It was reported that owing to the inability of the president to collect the necessary funds, nothing had been done during the year on either advertising or research. The president stated he had collected $600.39 for these purposes and that he deemed this inadequate to even think of launching on a program of this nature. He further stated that he had written many times to those who were delinquent, but with no tangible results, and after six months of effort he decided that it was not worth the effort. Most of those present agreed with Mr. Walton, but one or two believed that if a research man had been actually employed and something definite started, those who had not sent in their money would realize the necessity of fulfilling their obligations and would have made good. However, it was pointed out that at least $2000 should be available before starting any contemplated research work.

The question then arose as to what to do with the money already collected. Some were for returning the money and abandoning the idea, others believed the balance outstanding should be collected, and no final decision was arrived at until the last day of the meeting, when it was decided not to give up the idea of doing research work but to hold the money and to make an assessment of 5 cents per million brick to complete the fund. The amount of the assessment for this work aroused some opposition, resulting in the subject being undecided at the close of the convention, the discussion centering on details of assessment, method of payments, etc., and not necessarily on abandoning the idea of research entirely.

Coal-Cement Briquets as a Side Line

The morning session closed with the reading of a paper by **Truman A. King,** the Grande Brick Co., Grand Rapids, Mich., on "The Manufacture of Coal Briquets with Sand-Lime Brick Machinery." Mr. King's paper was, owing to the lateness of the program, not discussed to any extent. His paper was as follows:

"Early in September, C. W. Rankin, commercial coal salesman for Himes Coal Co., called on us regarding our fuel requirements for the winter months. During our conversation the subject of coal briquets came up and he suggested the manufacture of them on our presses. After some experimenting we found that with the addition of about three bags of cement to a ton of slack we could make a briquet that would be satisfactory.

"Pocahontas slack is a drug on the market and had been sold at $4.50 per ton delivered. The cost of cement was $1.53 for the three sacks; cartage of slack to and from brick plant, $1.40; our charge for manufacturing, $2.25 per ton, making the cost to the dealer $9.68.

"The slack, when hauled to our plant,

is dumped directly on our conveyor belt and conveyed to our sand hopper, the cement being handled the same as we handle hydrated lime, going through the volumeters and then the rod mill, from which we have removed all but about ten of the bars.

"We made the brick as thick as possible, as we were paying our help by the thousand brick and were being paid for the manufacture of the brick by the ton. They averaged 2⅞ in. in thickness. This made the brick weigh from 3370 to 3450 lb. per 1000, the difference in weight being due more or less to the grade of slack sent us.

"We tried steaming the brick to make them set quicker, but found that something in the steaming made them punky, so decided to let them set under our sheds to see how soon they could be handled. This was from about 12 to 16 hours after they were made.

"We made up 795 tons of these brick in 13 days, using one press all the time and the other part time.

"Our greatest trouble was getting slack fast enough to keep the plant running. We also had some trouble getting the brick off the factory cars in time, but these difficulties could be easily remedied by having the coal dealers haul the slack in before we started running and then pile the brick in our yard until they could be hauled away.

"The sale of these brick has been fairly satisfactory, but we believe that with a little advertising there could be built up a real demand for them.

"Several advantages of these brick are: their uniform heat, long burning, requiring the tending of fire only twice in 24 hours; the absence of coal dust and slack in the basement, and the amount of fuel that can be stored in the bin, there being an increase of about 25% over the amount when mine-run coal is stored.

"The only disadvantage is the increase in ashes, which is not so noticeable in bulk as in weight.

"We are at present working with the United States Gypsum Co., experimenting with the use of gypsum stucco for a binder, and expect to have more to report within a short time."

Officers Elected

During the morning session of the second day, officers for the year 1931 were elected. John L. Jackson, Saginaw, Mich., was elected president; W. A. Smythe, Toronto, Ont., vice-president; Miss Ellen Knight, Saginaw, Mich., secretary and assistant treasurer, and J. Finkbeiner, Detroit, Mich., treasurer. The following members comprise the executive committee: C. H. Carmichael, chairman, Boston, Mass.; J. Morley Zander, Saginaw, Mich.; Otto Schwartz, New Orleans, La.; A. S. Robertson, Toronto, Can.; J. G. Schluchter, Detroit, Mich.; J. C. R. Felker, St. Louis, Mo., and R. C. Kiser, Dayton, Ohio.

The report on answers to 20 questions asked by Kenneth K. Stowell at the 1930 convention showed that there were so many replies from producers that it would be necessary to compile them before presenting to the convention. It was decided to compile them and publish in the proceedings, and no discussion was made on the questions and answers, nor were any of the replies read at the meeting.

Freezing and Thawing Tests of Brick

Dr. Lansing S. Wells, United States Bureau of Standards, Washington, D. C., gave an informal talk on "Some Freezing and Thawing Tests of Commercial Sand-Lime Brick." As the work being done by the bureau is not completed, no definite statements were made that would give definite data pertaining to this subject. The doctor confined his remarks solely to telling his hearers of the methods being employed in the attempt to corroborate weathering qualities of sand-lime brick to data obtained from freezing and thawing tests. It is expected that later this year the tests will be completed and the information published.

The morning meeting adjourned to attend the convention luncheon where **B. C. Broyles,** attorney, president Atlanta Civitan Club, Atlanta, Ga., addressed the assemblage on the subject, "Atlanta the Capital of the Southwest." He confined his remarks to the subject matter as indicated by his text. Following the luncheon, moving pictures of southern industries were shown.

The afternoon session was opened by Dr. Wells who further elaborated on the freezing and thawing tests after which **J. W. Van Brunt,** Grande Brick Co., Grand Rapids, Mich., read a short paper on "Extra Cooking of Brick."

Extra Cooking of Brick

His paper in full follows:

"In the early part of 1929 the Grande Brick Co. purchased a Morehouse brick testing machine to be used particularly in sales work as at that time and for months previous there was considerable questioning about the quality of the brick. By good use of the testing machine it was possible to remove all doubt as to the superior quality brick that was being furnished. After a few months only occasional tests were required to meet objections by customers.

"During this time we made daily tests of the brick steamed the night before and in this way we were sure that our product was right. No record of these results was made until December, 1929, at which time the superintendent began recording the results of the tests on his daily report so he could compare his product with brick made in the past, to see if more perfect control would give better results. Close watch was kept of this record and after three or four months it was noticed that on Monday the tests showed much better than on other days, so we had something definite to work on.

"In studying these results it was only natural for the superintendent to consider any operation which might vary over the week-end and this happened to be in the method of curing the brick. It was customary to steam the brick for the regular period, beginning Saturday afternoon, and then close the valve in steam line from the boiler and allow the cylinder to cool without blowing off the steam until Monday morning. In practice this increased the steaming period a great deal without the use of the boiler or, in other words, without any appreciable increase in cost.

"During the year the plant was operating at about 50% of capacity, so it was possible to harden nearly all of the brick in this manner from then on.

"The results obtained were very gratifying. In 1929 the average modulus of rupture was 640 lb. per sq. in. During the first three months of 1930 the average was approximately the same, namely, 638 lb. per sq. in. Beginning in April all of the brick were hardened in the above way and the average results from then until the first of November was 798 lb. per sq. in. At this time one of the hardening cylinders was put out of commission, and the average modulus of rupture for the next two months dropped to 676 lb. per sq. in.

"From the foregoing facts obtained at this plant, partially verified at another plant, it has been decided to use this method as much as possible in hardening the brick made in the future. We believe that the product will then avoid all criticism and that it will be specified on more work, making the sales easier and the market larger."

Sand-Lime Brick Opportunities in the South

Following Mr. Van Brunt's paper, **Dr. Poole Maynard,** industrial geologist for the A. B. & C. Railroad Co., Atlanta, Ga., told the convention of the raw materials available for manufacture of sand-lime brick. Apparently there is available plenty of high silica sands in the district, lime available from the Cartersville district adjacent to Atlanta and coal can be obtained at reasonable cost.

The paper by **John R. Kauffman,** Crume Brick Co., Dayton, Ohio, on "Some Causes of Variations in Sand-Lime Brick" was read by J. Morley Zander. The paper was as follows:

Causes of Variations in Brick

"For about two years past we have been testing our daily output of brick on our Morehouse testing machine for

transverse strength. We usually take three brick from each cylinder and average their cross-breaking load in pounds per brick and enter the record in a book kept for that purpose. With brick made the same day, we would find a variation of a few pounds up to several hundred pounds. In trying to determine the cause of this variation we found that on our type of rotary presses, pressing two brick at a time, there was considerable variation in strength in the two brick made in pockets filled at the same time.

"There is a variation also due to the height of the mix in the agitator feeder, and this probably accounts for the abnormal strength of a few of the samples in the tests shown in the tables following.

"We found that brick made in the pocket or mold nearest the center plunger plate on a right-hand press are the weakest and usually measure slightly less in thickness than those made in the other pocket. Apparently the agitator or feeder paddles pack more material in that one of the two pockets being filled at the same time that is furthest from the center plunger.

"We have not as yet discovered the cause or done anything to correct the condition, but we hope to attack this problem in the near future.

"One simple device that may at least partially correct the condition would be to raise the top plate of the plunger making the stronger brick, by inserting a shim of a thickness that would compensate for the unequal filling of the two pockets.

"There is a possibility that a change in speed of the agitator paddles may help equalize the feed, just as the speed of a rod mill must be at the right number of r.p.m.'s to get satisfactory grinding results. (See Table 1.)

"On these tests the grind was uniform, the moisture constant, and the agitator one-half full of the sand-lime mixture.

"It will be noted that brick Nos. 1F, 7F, 13F, are made in the same pocket, likewise throughout the series.

"Without exception pockets filled to the front of the agitator make the stronger brick in comparison to those pockets to the rear of the agitator made at the same time.

"The F series were slightly lighter in color than the B series.

TABLE 2—CEMENT BRICK—MADE ON No. 1 PRESS

Following are some of the results **obtained on** brick made on the same press at the same time; the stronger brick being made in the pocket last to move under the agitator, and the weaker brick made in the pocket that moves first into the agitator opening and nearest the pressure plate:

Front pocket (stronger brick)

First series, 3-day test	1900 brick	$2\frac{5}{16}$ in.
	1900 brick	$2\frac{5}{16}$ in.
	1650 brick	$2\frac{1}{4}$ in.
Second series, 3-day test	1600 brick	$2\frac{5}{16}$ in.
	1500 brick	$2\frac{5}{16}$ in.
	1200 brick	$2\frac{5}{16}$ in.
Third series	1500 brick	$2\frac{5}{16}$ in.
	1500 brick	$2\frac{5}{16}$ in.
	1400 brick	$2\frac{5}{16}$ in.
Fourth series	1500 brick	$2\frac{1}{4}$ in.
	1400 brick	$2\frac{1}{4}$ in.
	1400 brick	$2\frac{1}{4}$ in.

Back pocket (weaker brick)

First series, 3-day test	1600 brick	$2\frac{1}{4}$ in.
	1100 brick	$2\frac{1}{4}$ in.
	1250 brick	$2\frac{1}{4}$ in.
Second series, 3-day test	1100 brick	$2\frac{3}{16}$ in.
	1500 brick	$2\frac{3}{16}$ in.
	1300 brick	$2\frac{3}{16}$ in.
Third series	1400 brick	$2\frac{3}{16}$ in.
	1350 brick	$2\frac{3}{16}$ in.
	1350 brick	$2\frac{3}{16}$ in.
Fourth series	900 brick	$2\frac{3}{16}$ in.
	1200 brick	$2\frac{3}{16}$ in.
	1000 brick	$2\frac{1}{4}$ in.

"While all the brick shown in the tables would pass Federal and A. S. T. M. specifications for common or medium brick on the transverse tests, it does not look well to have such variations in strength and I believe if we operators of this type of press will do some experimenting we can solve it in a short time. If anyone has the solution, we would appreciate his advising our company as to how he accomplishes it."

Mr. Zander then read the paper prepared by **Chester H. Carmichael,** American Brick Co., Boston, Mass., on the "Effect of Moisture Changes on Sand-Lime Brick." We quote Mr. Carmichael as follows:

Effect of Moisture Changes on Sand-Lime Brick

"It is a well known fact that many building units made up for masonry construction show a marked loss of strength when tested while wet. This fact has led some to the erroneous conclusion that the continuity of moisture changes would break down the hydrocalcium silicate bond of sand-lime brick.

"We felt confident that the reverse was true, but to convince ourselves and others we selected ten sample brick, as listed below. These brick were chosen to cover the full range of quality. We submit the following report as submitted by Prof. H. W. Hayward, of the Massachusetts Institute of Technology.

Date of Tests: October 15, 1930. Order No. A-175

Specimens: 10 sand-lime bricks submitted by Mr. Carmichael. These bricks had been cut in halves. "One-half of each brick had been stored in a dry location since June 14, 1930," and will be listed under (1). "The other half of each brick had been wet and dried 26 times, the operation consisting of being placed under water for two days, and being dried for two days," and will be listed under (2).

Compression tests: The samples were tested, as submitted, in a Universal testing machine. Blotting paper was used between samples and the bearing surfaces of the machine. Load was applied at the rate of 0.1 in. per min.

Sample	Compression strength (1) Untreated lb. sq. in.	Compression strength (2) Treated lb. sq. in.
C 1	6800	7490
S 1 W	5170	7000
S 2 W	3940	4910
S 3 W	5300	6930
S P C 1	4310	5970
S P C 2	4000	5510
S P C 3	4220	5900
S P 1	3400	4120
S P 2	3150	4620
S P 3	2870	3780

"As a result of this research we are armed with definite information concerning the moisture changes in sand-lime brick.

"This test of course simply covers one phase of weather resistance. It is still necessary to consider the action of frost, efflorescence, chemically charged atmosphere, expansion and contraction, and erosion by wind and rain.

"At present we are seeking information regarding the factors causing disintegration in the poorest grades of sand-lime brick. This study has developed some very interesting problems. We are not ready to offer any conclusion but we offer the following as food for thought

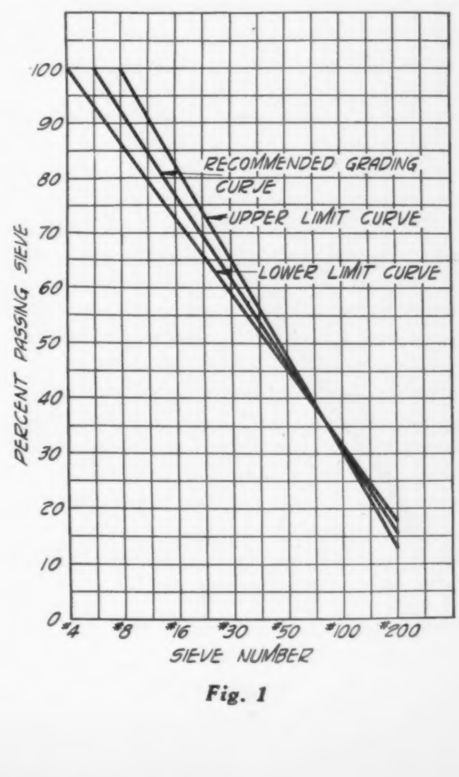


Fig. 1

TABLE 1—TESTS OF SAND-LIME BRICK FOR CAUSES OF VARIATION

Brick made 1/21/31. Tested 1/23/31. Made on No. 3 Press.
"F" Front pocket filling in the agitator nearest operator.
"B" Back pocket filling in the agitator nearest pressure plate.

Mark		Pocket	Weight	Breaking load	Pocket	Weight	Breaking load
No. 1	F	No. 1	5 lb. 6½ oz.	1350 lb.	No. 2	5 lb. 5½ oz.	1000 lb.
No. 2	F	No. 3	5 lb. 8½ oz.	1550 lb.	No. 4	5 lb. 7 oz.	1350 lb.
No. 3	F	No. 5	5 lb. 8½ oz.	1650 lb.	No. 6	5 lb. 7 oz.	1200 lb.
No. 4	F	No. 7	5 lb. 9 oz.	1450 lb.	No. 8	5 lb. 7 oz.	1400 lb.
No. 5	F	No. 9	5 lb. 11 oz.	1800 lb.	No. 10	5 lb. 7 oz.	1200 lb.
No. 6	F	No. 11	5 lb. 6½ oz.	1600 lb.	No. 12	5 lb. 6 oz.	1250 lb.
No. 7	F	No. 1	5 lb. 5 oz.	1500 lb.	No. 2	5 lb. 8 oz.	1350 lb.
No. 8	F	No. 3	5 lb. 9 oz.	1700 lb.	No. 4	5 lb. 7 oz.	1400 lb.
No. 9	F	No. 5	5 lb. 6 oz.	1500 lb.	No. 6	5 lb. 7 oz.	1450 lb.
No. 10	F	No. 7	5 lb. 12 oz.	1950 lb.	No. 8	5 lb. 9 oz.	1450 lb.
No. 11	F	No. 9	5 lb. 8 oz.	1450 lb.	No. 10	5 lb. 6 oz.	1300 lb.
No. 12	F	No. 11	5 lb. 7 oz.	1500 lb.	No. 12	5 lb. 4 oz.	1450 lb.
No. 13	F	No. 1	5 lb. 7 oz.	1750 lb.	No. 2	5 lb. 5 oz.	1300 lb.
No. 14	F	No. 3	5 lb. 9 oz.	1750 lb.	No. 4	5 lb. 7 oz.	1500 lb.

and as a part of a definite program of research.

"First: We feel that homogeneity of the brick structure is necessary to divide the frost stresses equally.

"Second: The grading of sand appears to have more influence on frost resistance than any other factor. We found that brick made from sand having uniform grains offered the least resistance to frost. We further found that brick made up of sand graded according to the following chart, were immune. (See Fig. 1.)

"You will note the curve of grading of sand giving the maximum density in the resulting product is the straight line on the chart. The other two are limits of variation which give comparable results. These curves refer to gradings before mixing with the lime and grinding.

"Third: We believe a study should be made of the capillary structure of sand-lime brick. We placed two brick on end in one inch of distilled water. One brick was a sand struck clay brick of good quality. The other was a sand-lime brick of good quality. After standing in water for two days the clay brick was wet at the top, while the moisture had risen but two inches on the sand-lime brick. At the end of two months the sand-lime brick was still dry at the top. We then dried the two brick and submerged them in water for seven days. The sand-lime brick took up 2% more water than the clay brick. The inference is that the clay brick is made up of many capillary cells, which carry the moisture to the top of the brick very rapidly, while in sand-lime brick the capillary attraction is very weak.

"Fourth: Any amount of vegetable matter, such as is found in overburden, is very detrimental to frost resistance.

"Fifth: Any salt which will effloresce will materially assist frost in the process of disintegration.

"Sixth: Brick made up from an aggregate containing a moisture content of 8% will withstand the frost action much better than those containing less."

The paper on "Competitive Conditions and Trade Practice Codes," by **N. C. Rockwood**, editor of ROCK PRODUCTS, was read by Walter B. Lenhart, associate editor of the same publication. In this paper it was suggested that the Sand-Lime Brick Association take some such action as was done by the National Sand and Gravel Association and the National Crushed Stone Association when they prepared a resolution on legislative action pertaining to revisions of the Sherman anti-trust law and others. J. M. Zander held that competitive conditions should be left unregulated and that the government be kept from interfering with business. A few extracts from the paper follow:

Competitive Conditions—How Can They Be Improved?

"Competitive conditions at the present time are too thoroughly experienced by everyone to require elaboration. Whether the present conditions are caused by over-production or under-consumption, which seems to be the burden of discussions, it is hardly more than quibbling over the terms, since in the end they mean practically the same thing—that our knowledge and experience in production far exceeds our knowledge and experience in sales and distribution, so that managers of industry, up to the present time, have been incapable of balancing the two, as they must ultimately be balanced, if industry and society are to proceed on an even or normal keel.

"There is no intelligent producer in industry who does not know how many units of his product he can turn out in an eight- or ten-hour day, and how many days on an average during the year he can operate to this capacity, and what his costs will be to produce his products at this rated capacity. In other words, his knowledge of practically all factors of production is exact.

"On the other hand, producers have very little knowledge of the prospective demand for their material, one month, two months, six months or a year in advance. Even in industries where it has been possible to collect and analyze statistics based, for example, on building permits and contracts awarded in construction, where a fairly reliable estimate may be obtained of prospective construction, there is still the large element of uncertainty as to what proportion of the business available any single producer may be entitled to.

"All our business experience in the past has been based on the theory that a producer is entitled to all that he can get regardless of his competitors—that the prime law of business self-preservation is to look after one's self above all things.

"We have only to stop and think that in the not very far distant past this was in general the personal code of nearly all members of society. We have gradually outgrown this point of view and are much more considerate of our fellow humans, and we have passed thousands of laws to protect society and individuals from other individuals having sufficient strength, influence and power to do their own will regardless. Yet in general, very little has been done to apply the same code to business; and until very recently probably business codes as naturally practiced and understood entirely permitted, if they did not approve, any lengths a competitor might go to preserve his business at the expense of his competitors, because competition has been looked upon as a kind of war, the guiding principle being 'All's fair in war'.

"During the last thirty years there has come about a great change in sentiment and thought as to the purpose and scope of business. The present function of a business association has been defined as an organization to exert beneficial and stabilizing influences and yet maintain the advantages of individual control of prices and production policies of each member. By virtue of funding common experience and sharing expenditures pro rata, facilities possessed by large scale enterprise can be obtained which otherwise would be too expensive for a manufacturer or merchant of moderate means alone. Competitors have of necessity become cooperators.

"The Federal anti-trust laws of which, of course, the Sherman anti-trust law is the most known, it is generally agreed are good and constructive laws in essence, in that they are founded on common law or, in other words, unwritten law, which aims always to protect the public from all who, by reason of their power and influence and unscrupulousness, desire to oppress the common people. In other words, the fundamentals of the Sherman law really go back much farther than the history of the industry and have their roots in the very fundamentals of popular government.

"The essentials of competition, upon which the law insists, involve elements of equal opportunity for each competitor, a free field with no discrimination, and no restrictive arrangements to prevent each competitor from exercising his individual discretion in the matters of price, production policy and choice of markets and customers.

"But freedom of competition, or freedom in competition, has a double aspect. There is such a thing as freedom to combine upon reasonable and normal terms, as well as a freedom to compete. In the interest of achieving a rational, as contradistinguished from destructive competition, the relative emphasis, for the time being, is upon the former aspect of competitive freedom.

"Recent decisions of the United States Supreme Court in anti-trust cases, more particularly the well-known portland cement manufacturers' case, have emphasized this freedom of competitors to enter into reasonable agreements in trade associations to obtain information which will prove helpful to them in arriving at the price of their product individually but intelligently.

"Notwithstanding these decisions of the Supreme Court, business men who have given the matter a great deal of thought are convinced that the present Federal anti-trust laws should be amended in such a way that they may be a more definite guide and a more definite help in the regulation of industry. The whole issue, of course, revolves about the mat-

ter of price fixing for any attempt to limit or pro-rate production such as is necessary if producers are to acquire and use the same intelligence and the same knowledge in regard to marketing and distribution that they already have in the matter of production.

"'Price fixing in restraint of trade' is contrary to all the Federal anti-trust laws and state anti-trust laws.

"Really all Congress need do to satisfy many who have studied the subject is to change this phrase 'restraint of trade' to 'unreasonable restraint of trade'. Of course the interpretation of the unreasonableness of the restraint of trade will rest with the courts as it does now, but as the law stands, the courts have little leeway in passing upon the desirability of price-fixing for the public benefit.

"There are certain fundamental principles in the conduct of business which are fairly well recognized as unethical and unfair. Various industries have attempted to improve conditions in their industries by declaring such methods unfair and by attempting to enforce the rules with the help of the Federal Trade Commission and the courts.

"Of these principles apparently there are only two that the Federal Trade Commission can legally enforce. All others, in some way or other, affect prices directly and consequently fall under the statutory prohibition of price fixing. Yet they are the very fundamentals of competition.

"As the case stands at the present moment, the Federal Trade Commission has no power to enforce such rules and its power even of approving of such rules in trade practice conferences, is questioned; so that while business men may agree among themselves to observe these rules, they run a certain element of risk of prosecution if in living up to these rules, prices in their industry should generally rise and the cause of this rise in prices should be attributed to their agreement to abide by any one or more of these rules.

"The petroleum industry has succeeded in at least two states, Oklahoma and California, in the pro-ration of production. In other words, of legally limiting production, and pro-rating the necessary production among producers. This has been done under state conservation laws which recognize the sovereign police power of the state to control the waste or conservation of its own natural resources. It is doubtful if any product other than possibly coal or valuable mineral could have its production controlled by the same methods. The United States Supreme Court has yet to pass on the affect of this pro-ration in the petroleum industry on the Federal anti-trust laws.

"Every producer will undoubtedly recognize that if we are to have intelligent government of business in the future, it must come largely with the help of intelligent business men, and no matter how intelligent business men are, if the rank and file of them do not express themselves when they have the opportunity, they will have no right later to complain if such legislation as may be adopted is harmful. We all owe it to society to do our part to eliminate one of its greatest hazards—the human misery that follows industrial failure."

Mr. Zander read a paper prepared by **John Graham**, manager, Jackson Traffic Bureau, on "Freight Rates and Their Effect on Business," which follows:

Freight Rates

"There are three major transportation matters occupying the attention of Congress, the Interstate Commerce Commission, the state commissions and the shippers at the present time:

"1. Consolidation of railroads.

"2. Competition of trucks, busses, boats and pipe lines with the railroads.

"3. Regulation of bus and truck lines engaged in the movement of state and interstate traffic.

"Notwithstanding President Hoover's approval of the consolidation of the Eastern railroads into four great systems, there is doubt that there is any strong public demand for such consolidations; certainly the Senate has not concurred in his views. Senator Couzens, chairman of the interstate and foreign commerce committee of the Senate, accuses the President of using undue executive influence on the Interstate Commerce Commission, and publicly states there is no proposal to reduce costs of transportation to the public or to benefit labor, through these consolidations, leaving the implication that only certain other interests expect to benefit.

"The railroad executives of the American Railway Association recently complained in brief of the inroads to their business being made by trucks, busses, pipe lines and boats, calling particular attention to what they claim amounts to subsidy to other means of transportation with particular reference to the building of roads and such projects as the Panama Canal and St. Lawrence waterway. This may possibly be for the purpose of laying grounds for legislation enabling them to again operate boat lines and add trucks, busses and if advisable pipe lines to their facilities

"The Senate interstate and foreign commerce committee recently reported out a bill to regulate busses and trucks engaged in interstate commerce. This bill was sent back to the committee because it did not provide for the possible co-ordination of other transportation facilities with the trucks and busses.

"It is believed by some of the best informed observers that the curse in the common carrier truck situation today is cut-throat competition and lack of co-ordination among trucking companies, and that shippers will not be able to get through bills of lading or contracts of carriage over all truck lines until there is more constructive regulation pointing to the Act to Regulate Commerce and the Esch-Townsend Act which carried a penalty for rate cutting and rebating among the railroads, as one of the first Acts in constructive railroad legislation.

"An interesting situation has developed during the depression. Railroad representatives and shippers have discovered that mileage scales ordered in by commissions have brought about in many cases an inflexible freight rate situation that is making it impossible to provide rates that would meet conditions and move traffic, with the result that the best informed men are backing away from the factor of distance as being controlling in the making of freight rates. This may bring about a radical departure from the present methods of making these rates, particularly if it is shown that the railroads' right of initiative has been taken away from them, a fine point between Federal and State regulation, or control of utilities.

"Agitation has been started in Michigan for complaints to be filed with the Michigan state commission looking to the application of the short haul common brick scale prescribed by the Interstate Commerce Commission in Docket 10733 (for application within Central Freight Association territory) on movement of brick within the State of Michigan. Complaint will probably be filed by the Detroit Board of Commerce and joined in with or intervened in by other commercial associations and brick companies in the state. From the skeleton of the proposal, the complaint of the Detroit Board of Commerce will include the sand-lime brick rates.

"This raises a delicate point, wherein the 10733 scale was not made applicable on sand-lime brick and the railroads have never voluntarily published rates made on the 10733 basis on sand-lime brick. The rates have generally been forced in by the state commissions and by the Interstate Commerce Commission in the Indiana brick case. Neither has the Michigan state commission had either the common or sand-lime brick rates before them.

"The railroads' defense will, therefore, be the same as in other cases, that sand-lime brick is not entitled to the rates on common brick. It would, therefore, seem that the industry should take the same interest and produce the same line of testimony in the Michigan case, if brought, as they did before the Pennsylvania, Ohio and Indiana commissions, and in the Northern Indiana Brick Co.

case before the Interstate Commerce Commission.

"Whatever is done to the rates on common brick must effect the rates on sand-lime brick; and whatever is done in the consolidation of railroads, or their absorbing or adding additional facilities, such as boats and trucks, will have, through the removal of competition and other factors, an immediate effect on the sand-lime brick business as on other business."

The last paper to be delivered was one by **J. Morley Zander** on "Washing Sand for Brick Making." His paper was as follows:

Sand Washing

"What led the Jackson Brick Co. to undertake washing its sand were the difficulties met in preparing a uniform sand by dry screening from the material as it came from the pit. This pit contains strata of hard packed quicksand, claylike in appearance, and small stratum of gravel, along with an excellent sharp sand. A screen coarse enough to prevent the quicksand from blinding it in rainy weather was too coarse to give accurate grading at all times, so the use of water to wash the sand through a fine screen is used and gets results.

"This washing process permits close screening, removes most of the clay and loam, and distributes the quicksand through the main body of the sand in a satisfactory manner. No periodic analysis has been made to determine the average screen composition of this sand, but the appearance of the brick and the action of the machinery would indicate a satisfactory grading with little, if any, fluctuation of proportions.

"Preliminary tests taken from time to time would indicate low absorption, and a very satisfactory modulus of rupture. No series of tests have been made by a recognized laboratory, so I cannot give definite data.

"In trying to find literature on the subject of sand washing, there seemed to be little of it, and none at all covering washing sand for brick making. When sand washing has been undertaken in any industry, it has been for some special reason, and had a special layout and special machinery. C. E. Patty of the American Aggregates Corp. gave me the idea of a simple plant. From that idea we worked along making up plans as we went and adopting them to our use.

"When we began our layout, it seemed to us that the washing plant should be in the sand pit and take up as little room as possible. This idea has worked out all right. The dragline scraper runs either side of the washing plant and is used both to dig raw sand and to handle the washed sand to the conveyor running into the factory.

"The washing plant is a frame tower 4 ft. wide, 10 ft. long, 30 ft. high. At the top is a vibrating screen carrying a screen cloth of about 3/16-in. mesh. The sand is fed to this screen from an incline belt conveyor running from the bottom of the pit to the top of the tower. Water is flowed on to the screen with the raw sand in sufficient quantity *only* to wash all of the fine material through. The gravel and small stones are discharged to a chute that carries this oversize material to a pile on the ground. The fine sand and water is dropped through the screen into an automatic settling hopper. From this settling hopper the muddy water overflows and is carried away through a long trough or flume to a low piece of ground. The clean sand dumps automatically to either side of the washing tower and is allowed to leach there on the ground. This sand is recovered with a drag scraper and sent into a brick plant. Sand can be washed, leached and used in about 24 hours after it is first dug from the pit, and as a pile is built on each side of the washing tower, one pile can be used while the other accumulates.

"So far washing sand is doing all that we hoped it would. It gives a clean uniform graded sand to make brick, which is something that cannot be obtained when using bank run sand from pits that vary in makeup."

During the afternoon the members and guests of the association were taken to view the South's famous confederate monument, Stone Mountain, near Atlanta, Ga., where the confederacy is commemorated by huge carvings on the face of this mountain.

Registration

Acme Brick Co., I. C. Toepfer, Milwaukee, Wis.
American Brick Co., C. H. Carmichael, Boston, Mass.
American Brick Co., Inc., Otto Schwartz, New Orleans, La.
Boice Brothers, O. E. Boice, Pontiac, Mich.
Bureau of Standards, L. S. Wells, Washington, D. C.
Grande Brick Co., J. W. Van Brunt, T. A. King, Grand Rapids, Mich.
Hardinge Co., J. K. Towers, York, Penn.
Jackson & Church Co., John L. Jackson, Saginaw, Mich.
Jackson Brick Co., J. Morley Zander, Jackson, Mich.
Louisville Cement Co., W. F. Irwin, Jr., Louisville, Ky.
Michigan Pressed Brick Co., J. Finkbeiner, Detroit, Mich.
National Brick Corp., H. J. Levine, Long Island City, N. Y.
National Lime Asociation, H. A. Huschke, Washington, D. C.
Northern Indiana Brick Co., Wm. F. C. Dall, Mishawaka, Ind.
W. A. Riddell Co., L. Haigh, Bucyrus, Ohio.
Rochester Sand and Brick Co., J. G. Schluchter, John Franko, Detroit, Mich.
ROCK PRODUCTS, W. B. Lenhart, Chicago, Ill.
Saginaw Brick Co., Conrad Fern, Saginaw, Mich.
Sand Lime Products Co., T. C. Tayler, Detroit, Mich.
Allen G. Walton, Hummelstown, Penn.

GUESTS

Ladd Lime and Stone Co., L. J. Bachus, Cartersville, Ga.
T. R. Lawson, Rensselaer Polytechnic Institute, Troy, N. Y.
Dr. Poole Maynard, geologist, A. B. and C. R. R. Co., Atlanta, Ga.
Mr. Smith, assistant state geologist, Atlanta, Ga.
South Eastern Underwriters Association, W. D. Cates, Atlanta, Ga.
Superior Lime Co., Mr. Bridgewater, Pelham, Ala.

Stone Company's Salesman Named Ohio Highway Engineer

ELMER HILTY, of Lima, Ohio, district sales manager of the National Lime and Stone Co., of Findlay, has been named chief engineer of construction in the Ohio State Highway Department.

The appointment was made by O. W. Merrell, state highway director, who was named early in January by Governor George White.

Mr. Hilty will succeed H. P. Chapman, who has been with the department for many years as chief engineer of construction. Mr. Chapman was promoted to be asistant director of the department, a position paying $5000 a year.

Mr. Hilty was graduated from Ohio Northern University in 1904 and his engineering experience dates from that time. He was assistant in the county surveyor's office of Hancock county at Findlay for a few years and then was resident engineer for the Chicago Lake Shore and South Bend railroad.

Following his return to Findlay he was elected county surveyor, and then he served two years as division engineer of the state highway department at Findlay under Governor Cox.

For the last eight years he has been sales engineer for the National Lime and Stone Co., of Findlay, having charge of the Lima office of the concern in the Old National-City Bank Bldg.—*Lima* (Ohio) *News.*

Pennsylvania Quarry Operator Expanding Facilities

IMPROVEMENTS contemplated at the Youghiogheny Crushed Stone Co. plant at Casparis, Penn., near Connellsville, will provide employment for a hundred additional men, George Vang, of Pittsburgh, president of the company, announced. The improvements, to cost $175,000, are to begin in ten days. They include, Mr. Vang said, a road surfacing plant with a capacity of 1200 tons daily, and facilities for increasing the ballast output to 40,000 tons monthly.—*Philadelphia* (Penn.) *Inquirer.*

Contract Prices in British Columbia

CONTRACTS FOR SUPPLIES for the Greater Vancouver and District Joint Sewerage and Drainage District, aggregating $18,000, were awarded recently.

Contracts awarded were as follows: Cement, Balfour, Guthrie Ltd., and Evans, Coleman & Evans, $2.72 a bbl.; washed gravel, Deeks Sand and Gravel Co., $1.54 a cu. yd.; pumped sand, T. G. McBride & Co., $1.40 a cu. yd.; washed sand, Deeks Sand and Gravel Co., $1.50 a cu. yd.—*Vancouver* (B. C.) *Morning Star.*

Sand for Odd Uses Helps Unemployed in Ann Arbor, Mich.

SAND for icy walks and porches, for children's sand boxes, for hot air furnace tops and for other purposes, is made conveniently available to Ann Arbor citizens in the sale of sand by the jobless under the supervision of the mayor's committee on unemployment.

The sand and the bags containing it are donated and the money from its sale is a net gain for the unemployed. The sand is sifted from a gravel pit of the University which is donating it through Shirley W. Smith, vice-president and secretary, who is serving on the city unemployment committee.

The University's donation of bags was exhausted in the sale Monday and Tuesday but an additional lot was given by W. H. L. Rohde as a contribution to the mayor's project. Thus far about 200 sacks have been sold and increased response to sale is indicated in the orders being received.

The sacks, which contain 90 to 100 lb. of sand, retail at 25c each, the bags being about half full. Bags three-quarters full are being sold at 35 cents. Men with automobiles assisted by other jobless are being assigned to the work by the unemployment exchange and are being directed by E. C. Pardon of the building and grounds department of the University.

"Every year there arises the difficulty of keeping the sidewalks free from ice. There are questions in the Oracle, the police are asked to take measures to enforce cleaning of walks, and the committee now provides sand which will easily take care of the icy walk situation," a member of the mayor's committee said.

All the profit from the sale goes to the unemployed men selling the sand. Aiding this project the unemployment exchange in the Chamber of Commerce building is opening its service to receive orders from residents wanting sand and these orders may be placed by telephoning the office direct or by mailing the coupon appearing in the *Daily News*.

Each man engaged in the work, and there are more than a dozen now being kept busy, is given a letter of identification from the mayor's committee, to be shown when making sales.—*Ann Arbor* (Mich.) *News*.

Pioneer Sand and Gravel Company Buys Out Competitor

SALE of the Steilacoom Sand and Gravel Co., Steilacoom, Wash., for a consideration of $90,000 to the Pioneer Sand and Gravel Co., of Seattle, has been announced. Included in the transaction are pits, machinery and acreage. The Seattle concern, which purchased the property from John S. Baker and W. C. Thompson, has been operating in Pierce county pits for some time.—*Tacoma* (Wash.) *Times*.

J. Robert Nugent

J. ROBERT NUGENT, 58, vice-president and one of the founders of the Nugent Sand Co., Louisville, Ky., died Wednesday, January 14, after an illness of fifteen months.

He was born in Louisville and lived in that city all of his life, having received his education in the public schools there.

Mr. Nugent, who was also a member of the firm, W. F. Nugent Bros., railroad contractors, joined two of his brothers in starting the Nugent Sand Co. 35 years ago.

J. Robert Nugent

During these years, the company, which was one of the pioneers in the washed river sand industry, grew to twenty times its original size, and now owns one of the most modern plants on the Ohio river.

Mr. Nugent is survived by his mother, Mrs. Katherine E. Nugent; three brothers, William F. Nugent, president of the Nugent Sand Co., Thomas C. L. Nugent, secretary and treasurer of the same company, and Edward B. Nugent, of the R. I. Nugent Real Estate Company, and two sisters, Madam Nugent, of the order of the Madames of the Sacred Heart, St. Louis, Mo., and Mrs. A. V. Griswold, Louisville.—*Louisville* (Ky.) *Journal*.

Bankrupt Ohio Sand Pit Changes Owners

JAMES W. MORGAN, Jackson, Ohio, was the high bidder for 63 acres of sand and gravel deposit owned by the Royal Sand and Clay Products Co. in Gallia county when it was sold at receiver's sale.

A Chicago bank bought in the plant for the bond holders and the Morrow Manufacturing Co. bought the equipment. This firm installed the equipment for the bankrupt company.—*Jackson* (Ohio) *Herald*.

Colorado Sand and Gravel Producer Has Complete Building Materials Line

IN THE SPRING of 1914, the Fountain Sand and Gravel Co., Pueblo, Colo., was founded by Fred H. Bullen, M. E. Bullen and J. A. Bullen. The principal business is to provide washed and screened sand for building and other purposes.

At that time the washing plant for sand and gravel which was started on the banks of the Fountain river was the first and only such plant in Colorado. The demand for sand and gravel of a specified kind became so great that two other plants were added, and the output of washed and screened sand and gravel was increased from 200 cu. yd. daily to 800 cu. yd.

It was in 1928 that the Red-E-Mix plant was added. At this plant cement, sand and gravel are mixed ready for use in concrete work.

Another aid to the contractors that was added by the Fountain Sand and Gravel Co. is the aging of lime for the making of brick mortar and the white plaster coat.

A varied line of mason's supplies is carried, including the Master Builder's colorings, waterproofing, and hardeners.

The Fountain Sand and Gravel Co. is also agent for the Western Elaterite Roofing Co. The firm is agent for the National Steel Fabricating Co., which makes Steeltex lathing for plastering and stuccoing as well as electric-welded reinforcing steel. Ariston steel windows are sold exclusively in southern Colorado by the Fountain Sand and Gravel Co. These windows are adaptable for the smallest dwelling or the largest building.—*Pueblo* (Colo.) *Star-Journal*.

Wins Extension of Time

THE UNITED STATES War Department has approved an extension of time to the Seaboard Sand and Gravel Co. in which to complete its dredging in Mt. Sinai harbor, on the north shore of Long Island. The work was supposed to have been finished by December 1, 1930, but is a long way from completion. Realizing that it would be impossible to meet the terms, the company requested an extension of time, and has been given until December 31, 1933. The trustees of Brookhaven Town on May 7, 1929, granted the company a permit to dredge in Mt. Sinai harbor, the company to pay the town at the rate of 5c a cu. yd. for the sand removed.—*Sayville* (N. Y.) *News*.

The Asphalt Industry

REPRINT of an article on the asphalt industry in 1929 by Prevost Hubbard has just been published by the Asphalt Institute, 801 Second avenue, New York City.

The article is a reprint of the chapter on asphalt from "Mineral Industry, 1929," with corrected figures by the Bureau of Mines.

Dallas Meeting Opens Regional Safety Series

Texas Cement Mills Drive for Perfect State Record

A PERFECT safety record for every cement mill in Texas was the objective set up at the regional safety meeting of the Texas plants held in Dallas on January 22 under the auspices of the Portland Cement Association.

The meeting was held at Hotel Baker, with O. V. Bartholomew, general superintendent of the Trinity Portland Cement Co., in the chair. The registration list for the morning session showed that seven of the eight member mills in the state were represented.

In his opening remarks, Mr. Batholomew traced the improvement of safety conditions in the mills of the state. He pointed with pride to the fact that it was a Texas mill which received the first annual safety trophy award from the association and that all three of the Texas mills operated under his supervision had been able to win the prize. Mr. Bartholomew felt that the time was ripe for a concerted effort to operate all of the mills of the state for a full year without accident, giving Texas leadership in another new achievement, not yet accomplished anywhere else.

The feature of the morning program was a series of short papers, by one representative from each mill, describing the most effective new idea used at that mill for the prevention of accidents during 1930. O. L. Hailey represented the Lone Star mill at Dallas, and H. O. Sutherland the Lone Star mill at Houston. V. K. Fischer spoke for the Trinity mill at Dallas, A. L. Harle, for the Trinity mill at Fort Worth and J. S. Cole, for the Trinity mill at Houston. H. E. Nichols, superintendent, represented the Southwestern mill at El Paso, and Ben McCrum, assistant superintendent, represented the Universal Atlas mill at Waco.

Mr. Fischer advocated that as many men as possible be encouraged to preside at general safety meeting and stated that for the bi-monthly meetings at their mill men were given no option but were assigned to preside according to the order determined by spinning a number wheel. Mr. Harle described the good results obtained by continuing a safety court at which all accused of following unsafe practices are tried by judge and jury with attorneys appointed for prosecution and defense. Mr. Nichols stated that results in safety work had been noticeably better at his mill since the appointment of one of his mechanical engineers as safety supervisor.

Houston Team—Trophy Winners
Left to right: J. D. Wilson, H. Krezdorn, R. C. Swonki, A. C. Estes, H. Gibson and J. S. Cole

Construction Complicates Safety Work

Mr. Hailey read a carefully prepared paper, some of the high spots of which are here given:

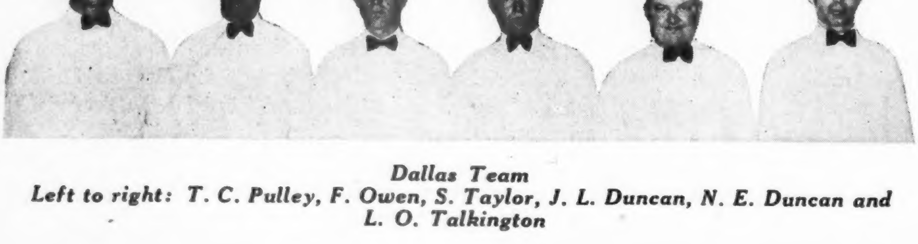
"While we did have several lost-time accidents last year, we feel that the record is not as bad as it would appear at first glance, because we had on a major construction program during practically the entire year, with the increased hazards accompanying such work. These included, of course, the much larger number of men, many of whom were unfamiliar with the plant; and the unusual nature of some of the jobs requiring the handling of very large and very heavy machinery. The hazards were increased by the fact that it was necessary to do this construction work without interfering any more than absolutely necessary with production.

"The greatest aid we have had has been teamwork or co-operation in accident prevention; which is, as I see it, the active expression of the thought that we are indeed our brother's keepers in so far as we can help him to complete a job safely. When every man has the active help of those working around him in guarding against accidents, we have teamwork and a mighty safe place to work.

"The development of teamwork as a real force in accident prevention at our plant came largely as a result of the safety cash award instituted some time ago by the officials of our company. Under this plan, a cash award is made each year to all men in any department which has gone through the calendar year without a lost time accident. Of course this award was in itself a primary force in our safety campaign and the teamwork to be secured as a result of it was a secondary consideration. However, since each man's chance of benefiting under this plan depended as much upon the safety habits of every other member of his department as upon his own, it was an inevitable result that he would watch the actions of his co-workers with a jealous eye. Also that a more conscious effort to help prevent accidents to others would result.

"This condition did not become effective at once, but during the year just passed has, I believe, been a predominating factor. A man who is too inclined to take a chance or who simply does not pay much attention to the safety angle of his job is pleasantly, often jokingly, but none the less firmly reminded that he is not playing square with the rest of the gang.

"It is our practice to have the different departments take turns in conducting the monthly safety meetings. On these occasions, a representative number of men from the department in charge are called on to say a few words. Naturally, among men not accustomed to speak in public these expressions are short but give a very good idea of the man's principal thought on the subject. I have noticed that more and more frequently during the past year the gist of these speeches has been that the men believed first that it was their duty to try to be safe workmen, and second that they should, as they expressed it, 'watch out for the other fellow'.



Dallas Team
Left to right: T. C. Pulley, F. Owen, S. Taylor, J. L. Duncan, N. E. Duncan and L. O. Talkington

Texas cement plants turned out a large representation at Dallas meeting

"It has also been apparent in the reporting of what were considered unsafe conditions and unsafe practices; for so often the thing reported has been something very unlikely to affect the man himself and it was quite evident that his interest was as much for the safety of others as of himself."

Made Safety Work a Sporting Event

Ben McCrum, reporting for the Waco plant of the Universal Atlas Cement Co., had been through a somewhat similar experience, in that the safety problem had been complicated by construction work. The plant started operation about the middle of 1929, and for the balance of that year had a large number of accidents. A large percentage were accidents which could not have been prevented by guards, but were due to inattention or carelessness on the part of the men themselves.

"We figured our main problem was to devise plans that would get the men interested and thinking along the line of safety, both for themselves and for the other fellow," said McCrum.

"One of the plans proposed for the solution of our problem, which proved to be more effective than any we had used to date, may not be entirely new to some of you. The plan adopted took the form of a sporting event, giving the men an objective to work to and at the same time brought the safety idea closely to their attention and held it there.

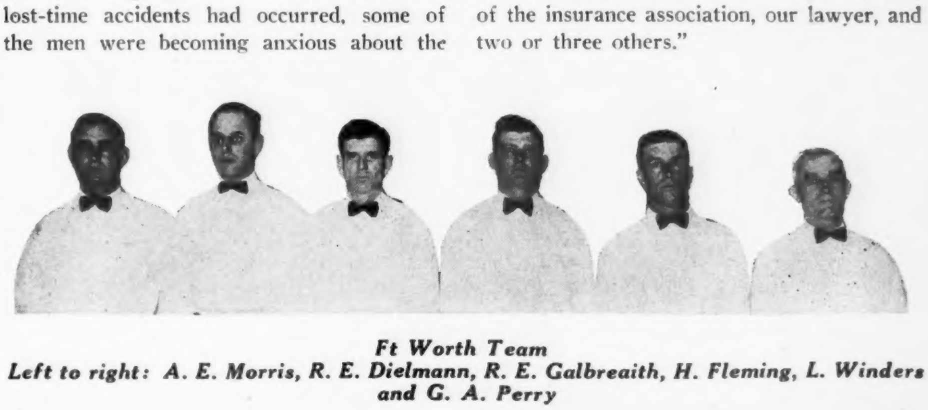
"We arranged a campaign, the duration of which was to be six months—January 1 to July 1. The employes at the plant were divided into eight teams with one man appointed captain of each team. In order to equalize the teams so far as liability of accidents was concerned, the men from the same departments were divided among the various teams, thus mixing the men doing hazardous work with the men doing less hazardous work. Each captain was given a list of the men on his team and each employe was advised who the captain of his team was.

"Most of the men at the plant were pretty much interested in baseball and we were planning a team for the coming summer so we decided to let the record take the form of a baseball percentage column and give each team a name, such as Giants, Cubs, Athletics, etc. A score card was placed on the bulletin board at the entrance of the plant bearing these names and information was shown on this card daily so that each man might know what had happened the day before or what had happened so far as lost time accidents were concerned to date.

"We carried the sporting idea somewhat further. After consulting with the safety committee and various representative men around the plant, we included a rule that in case any member of a team suffered an injury causing the loss of time, each member of that team was to pay a small fixed amount into a jack pot and at the end of the six months a banquet was to be given to the winning team. After this campaign had been in progress for some time and no lost-time accidents had occurred, some of the men were becoming anxious about the banquet and inquired as to just what would happen in case we went through the entire six months without a lost-time accident. They were informed by Mr. Wallerstedt, our superintendent, that in case this happened, the banquet would be given at the company's expense and that all employes would be invited.

"We are glad to say that the result of this campaign was much as we had planned; that is, the captain and all the members of the various teams were very much interested in any injury that occurred. The captain was notified at once whenever a member of his team was injured. This captain would get in touch with the injured man personally and find out the possibility of the accident being serious enough to cause the loss of time and impress upon the injured man the importance of avoiding such loss.

"We went through the six months without a lost time accident and the promised banquet was served in the dining room of the Shrine Temple at Waco. We made arrangements to seat everybody at the plant with the exception of five men, whom it was necessary to keep at the plant. In addition to our regular employes, we had as our guests, our plant surgeon, a representative of the insurance association, our lawyer, and two or three others."



Ft Worth Team
Left to right: A. E. Morris, R. E. Dielmann, R. E. Galbreaith, H. Fleming, L. Winders and G. A. Perry

Safety Guards Have Moral Effect

The morning's program was concluded with an excellent paper on "Investigation of Employes' Accidents" by C. A. Wallerstedt, superintendent, Universal Atlas Cement Co., Waco plant. The main points brought out by Mr. Wallerstedt are in the following paragraphs from his paper:

"During 1930 our plant at Waco had a total of 351 so-called injuries. This figure, of course, includes all minor scratches, burns and cases of dust in the eyes, which would not consume probably more than five minutes for treatment. In this list there were no fatal or what we would call major injuries. The only injury in this list which was of any consequence, and which could possibly have been prevented by the use of safety guards, was one in which the injured man lost three fingers, and it was the only lost-time injury during the year at our plant.

"Every employe, in his own opinion, is a careful worker. The careless things which he does at times do not seem careless to him until he has an accident and is injured, at which time he will admit that he was careless in that particular instance. In reading over the file of injury reports, particularly the causes of accidents resulting in injuries, a large percentage of them are amusing.

"I believe that the biggest value safety guards render is the moral effect upon the employes. If the company does not spend money to sufficiently guard all machinery, the employe will not believe that the company is as enthusiastic about its safety campaign as it pretends to be. It is essential that the employe know, beyond any doubt, that the company is as vitally interested in safety, or more so, than the employe. It is for this reason that about $15,000 is being spent at present at the Waco plant placing guards over every piece of dangerous machinery which it is at all possible to guard.

"A total of 351 injuries in one year appears to be an extremely large number, but bear in mind that every injury is reported, no matter how slight. This includes such trivial accidents as a particle of dust in the eye or a pin scratch on a man's finger. We have found that it pays to take care of each little scratch. Out of the 351 injury cases, 105, or a little less than one-third, were attended by a physician at an average cost of $8.00 per injury. Only one case required compensation, a case where a man lost his fingers, which cost the insurance company $1600."

After luncheon the meeting reconvened with H. E. Nichols, superintendent of the Southwestern Portland Cement Co.'s plant at El Paso, acting as chairman. C. J. Rutland, safety engineer of the Texas Power and Light Co. of Dallas, spoke on "Safety as an Operating Problem" and Merle D. Darrah, safety engineer of the Bureau of Safety, of Chicago, read an admirable paper on "Preventing Accidents During Construction and Maintenance." The formal program was then concluded with a profitable round-table discussion and the meeting turned over to Alexander U. Miller, safety engineer of the United States Bureau of Mines at Vincennes, Ind., who was present to take charge of the contest of first-aid teams. Mr. Miller was assisted as judge by C. A. Herbert and H. A. Soderquist also of the U. S. Bureau of Mines safety staff. The three teams which competed were those representing the three plants of the Trinity Portland Cement Co. at Dallas, Fort Worth and Houston. The contest, which included four standard problems, was finished with following scores:

Houston plant team	94 points
Dallas plant team	92 points
Fort Worth plant team	91 points

Trophy Presented

At the dinner Mr. Herbert presented the winning team with the Texas regional trophy, a large silver cup, contributed by the Texas members of the Portland Cement Association. It becomes the permanent property of any plant in the state whose first-aid team can win it three consecutive years at the annual regional contest.

J. W. Ganser presided at the dinner and W. H. L. McCourtie, president of the Trinity Portland Cement Co., was the principal speaker. After a novelty musical entertainment the crowd was invited to witness a local boxing bout as guests of Mr. McCourtie.

REGISTRATION

Lone Star Cement Co., Texas, Dallas—J. E. Bonnell, superintendent; Owen Carter, driller; J. T. Clemont, inspector of weights; R. M. Cone; K. E. Davis, quarry foreman; Will Dietz, shovel operator; L. L. Dillon, concrete tester; F. F. Fasting, warehouse foreman; E. S. Ferrell, electric department; L. M. French, chief mill clerk; O. L. Hailey, chemist; J. Q. Mitchell, repairman; G. T. Smith, shovel operator; I. D. Wilson, repair foreman.

Lone Star Cement Co., Texas, Houston—N. M. De Bruin, assistant superintendent; Frank McCracken, mix chemist; H. O. Sutherland, warehouse foreman.

Southwestern Portland Cement Co., El Paso—H. E. Nichols, superintendent.

Trinity Portland Cement Co., Dallas—R. O. Bartholomew, chief engineer; O. K. Bartholomew, general superintendent; Fred Buckett, civil engineer; W. B. Buckner; S. A. Davidson; D. D. Day, stock keeper; Newal Duncan, electrician; J. L. Duncan, carpenter; J. R. Everett; V. Fischer, chemist; L. M. Fisher, quarry foreman; E. C. Gambrell; J. W. Ganser, chief chemist; F. S. Gattis, stationary engineer; Ben Hammond, mill foreman; D. A. Helton, electrician; W. K. Huffman, carpenter foreman; Henry F. Lamb, general foreman; G. M. Orr, timekeeper; Frank Owen, repairman; E. S. Pickens, foreman; J. R. Poindexter, packing foreman; T. C. Pulley, construction superintendent; Lynn Roebuck, construction worker; J. H. Suell; J. W. Slingfellow, labor foreman; William O. Stuart, chief electrician; J. D. Summers, chief power engineer; C. A. W. Sutherland, shop foreman; L. O. Talkington, machinist; Sam Taylor, electrician; S. A. Taylor, electrician; W. K. Williams, chemist; R. C. Youngblood, foreman.

Trinity Portland Cement Co., Houston—J. S. Cole, chemist; A. C. Estes, operator; H. Gibson, operator; H. R. Krezdora, driver; R. G. Sutherland, superintendent; R. C. Swanke, crane operator; J. Dean Wilson, chemist.

Trinity Portland Cement Co., Fort Worth—A. W. Boho; A. A. Chaney, superintendent; R. E. Dielmann, chemist; H. Fleming, electrician; R. E. Galbreaith, machine shop foreman; A. L. Harle; S. E. Morris, foreman shipping department; Geo. A. Perry, foreman; J. M. Simmons, timekeeper; T. W. Smith, labor foreman; L. Winders, general foreman.

Universal Atlas Cement Co., Waco—Ben McCrum, assistant superintendent; C. A. Wallenstedt, superintendent.

Miscellaneous—A. J. R. Curtis, assistant to general manager, Portland Cement Association; M. D. Darrah, safety engineer, Bureau of Safety, 2110-20 North Wacker Drive, Chicago, Ill.; F. H. Etheridge, safety engineer, Aetna Insurance Co., New Orleans, La.; C. F. Herbert, foreman miner, U. S. Bureau of Mines, Vincennes, Ind.; William McLaughlin, office engineer, Portland Cement Co., Dallas, Tex.; Alex U. Miller, associate mining engineer, U. S. Bureau of Mines, Vincennes, Ind.; Stanley Owens, safety engineer, Portland Cement Association, 33 West Grand Avenue, Chicago, Ill.; C. J. Rutland, safety engineer, Texas Power and Light Co., Dallas, Tex.; A. J. Stromquist, first-aid miner, U. S. Bureau of Mines, McAlester, Okla.

Booklet Describing Films on Explosives

A NEW BOOKLET, entitled "See Explosives via Du Pont Films," has been issued by the Motion Picture Bureau of E. I. du Pont de Nemours and Co.

The booklet visualizes the use of explosives in national industries and explains that the subjects for the films have been selected so as to give the audience a complete story from the manufacture and testing of explosives through to their various uses in industry and agriculture.

Among the films described are "Letting Dynamite Do It"; "The Story of Dynamite"; "Dynamite in Quarry Work" and "Dynamite, the Modern Ditch Digger."

Hearing on Cement Tariff

THE FOLLOWING official notice has been received from the secretary of the United States Tariff Commission:

"Notice is hereby given, pursuant to Section 336 of the Tariff Act of 1930, that a public hearing in the foregoing investigation will be held at the office of the United States Tariff Commission in Washington, D. C., at 10 o'clock a. m. on the 12th day of March, 1931, at which time and place all parties interested will be given opportunity to be present, to produce evidence and to be heard with regard to the differences in costs of production of and all other facts and conditions enumerated in Section 336 of the Tariff Act of 1930 with respect to the following articles described in paragraph 205(b) of Title I of said tariff act, namely:

"Roman, portland and other hydraulic cement or cement clinker."

Beg Your Pardon!

IN THE REPORT of the convention of the National Crushed Stone Association, at St. Louis, Mo., ROCK PRODUCTS, January 31, p. 65, it was stated that the entertainment was provided by the St. Louis Quarrymen's Association and the Illinois Powder Manufacturing Co. It should be added that while C. W. Swanson, sales manager of the Illinois Powder Manufacturing Co., St. Louis, Mo., was the active member of the convention committee, some of the other powder companies contributed to the expenses. These were E. I. du Pont de Nemours and Co., the Atlas Powder Co. and the Burton Explosives, Inc.

Southern Illinois Lime Business Said to Be Fair

THE MASSIVE BLUFFS of limestone that rear their heads above the Mississippi river for miles to the north and south of Quincy, Ill., which have supplied quarrying firms in the city for more than 70 years, continued to yield their usual amount of material for various industrial uses during the past year.

Despite the fact that the general depression in all lines of business curtailed the industry to a certain extent during the year, the quarrying business was more than 80% of normal.

The deposits of limestone have withstood the blasting and digging of large gangs of workmen for years and yet the supply seems undiminished. For the greater part the companies are still working in the original diggings.

Tom P. Black of the Black-White Lime Co., said:

"Our normal output is in the neighborhood of 20,000 tons, and despite general business conditions throughout the entire country, last year our output was 80% of normal. We employ from 25 to 30 men under normal conditions and from 100 to 125 men are engaged in quarrying time.

"We do not look for any sudden improvement in the lime business this year, although the prospects are somewhat brighter. It will take at least another year before our business regains normalcy."

In addition to the Black-White Lime Co., the Menke Stone and Lime Co. and the Marblehead Lime Co. also operate several quarries.—*Quincy* (Ill.) *Herald.*

Fire Destroys California Lime Plant

FIRE destroyed two buildings and caused damage estimated at $25,000 at the Devore plant of the Pacific Lime and Cement Co. early January 23. The main building was saved through the efforts of State Forest Rangers A. T. Shay and John Anderson, assisted by 12 volunteer fire-fighters from the plant.

Water was pumped by the county emergency equipment from a 1½-in. hydrant at the nearby service station owned by Anita Baldwin.

Telephone service in Cajon pass was stopped by the blaze, making it impossible to telephone for help. Exactly one hour after the fire had begun, the state rangers were notified by the Santa Fe dispatcher in San Bernardino, who in turn had been notified by a conductor who saw the blaze from a passing train.

The complete plant was valued at $55,000, according to J. D. Baugh, manager. Four electric motors, the entire heating system and two buildings were totally destroyed, but the main building, valued at $30,000, was saved by the fire fighters. The rotary lime kiln was not damaged.

Investigation failed to disclose the cause of the fire. It was reported that there is no insurance on the property destroyed.—*San Bernardino* (Calif.) *Sun.*

Lime Convention to Be Held at White Sulphur

AT A MEETING of the board of directors of the National Lime Association held January 14 and 15 at Washington, D. C., it was unanimously voted to hold the thirteenth annual convention at White Sulphur Springs, W. Va., Wednesday and Thursday, June 3 and 4, 1931.

Definite arrangements have been made with the Greenbrier Hotel, at White Sulphur, and further announcements will be made from time to time as the program is worked into shape.

American Lime and Stone to Install Dust Collector

ANNOUNCEMENT is made that the American Lime and Stone Co., Bellefonte, Penn., is installing, at a total cost of $14,000, a dust collector designed to eliminate the lime dust nuisance which has long been a source of complaint by Bellefonte people.

A letter from Samuel Shallcross, vice-president of the American Lime and Stone Co., states that the operation of the dust collector was anticipated for about March 15. The machinery was to have been shipped from the factory on January 24 and allowance of a week made for transit and six weeks for installation.

The equipment consists of a Northern Blower Co. cloth collector with 5000 sq. ft. cloth area, using a 40-hp. motor. The collector is to be installed on the limestone drier.

Limestone to Be Mined at Fort Dodge, Ia.

A 60-FT. SHAFT sunk into a little ridge three miles west of Fort Dodge, Ia., will become one of the city's most important industries in a few years, if the hopes of Louis W. Smith, local mining and construction engineer, are realized.

Mr. Smith and Walter Welp of Humboldt are working a vein of St. Louis limestone, unusually high in the valuable calcium carbonate. From this mineral, building material and a host of other products are made.

Operations are crude enough at the present, but modern mine machinery, crushers, drills, and hoists, will soon be installed to hasten the work now that the men are confident of the success of their project.—*Fort Dodge* (Ia.) *Messenger.*

New Michigan Quarry Enterprise Progresses

TO BE IN PRODUCTION by August 1 of this year is the aim of Thunder Bay Quarries Co., now engaged in preliminaries looking toward opening a quarry and building a crushing plant on its property at the northerly limits of Alpena, Mich., according to statements by C. N. Windecker, president, and John T. Richards, vice-president, who came to the city Thursday from Pittsburgh to confer with C. R. Peregrine, secretary-treasurer and manager of operations, and to inspect the progress of the work.

"We are here to open a quarry and build a crusher with a production of a million and a half to two million tons of stone yearly," said President Windecker in an interview with a representative of *The News.* "Beyond that, we can not say now what our program will be because we do not know ourselves as yet. The building of a cement plant and other details will depend entirely on the condition of business in general, the progress of our initial development and other details which can not be forecast at this time.

"But we are here to stay. We propose to operate an industry that will be a credit to the community; we stand ready to 'chip in' for our share, to take our full part in the life of the community, to do all we can to make Alpena a better place to live.

"Under present weather conditions, the progress of our work naturally is slow. We shall not require additional workmen for a while yet but with warmer weather we expect to go ahead at full speed and it is our aim to have the plant in production by the first of August.

"We are gratified with the cordial reception accorded us in coming to Alpena and it is our hope that our relationships with the affairs of the community will continue always as pleasant as they have been so far."

Operations on the Thunder Bay Quarries Co. property are confined thus far to cutting and filling on the right of way of the plant tracks which will connect with the D. and M. railway at a point near the D. and M. yards, running thence over the company's property to the shore of Thunder Bay where the plant will be located.

Alpena industries in position to contribute to equipment of the plant will be given opportunity to bid on all work they can handle, agreed Mr. Windecker and Mr. Richards. The plant will be of the latest design in all particulars.

The capacity of the plant, 1,500,000 to 2,000,000 tons annually, means that it will at least equal the operations of the Michigan Alkali Co. and be larger than those of the Kelley Island Lime and Transport Co. and, in this district, second only to the Michigan Limestone and Chemical Co. plant at Calcite.—*Alpena* (Mich.) *News.*

Foreign Abstracts and Patent Review

Indirect Determination of Lime With Sodium Oxalate. Dr. A. Heiser has developed a simple and good method for indirect determination of lime, in which he uses the Soerensen sodium oxalate, which is more hygroscopic and crystallizes without water of crystallization. The author describes the preparation of the potassium permanganate solution and then gives his procedure in making the analysis. The method is applicable for determination of lime in cement and for examination of limestone, marls, etc.—*Zement* (1930) **19**, 49, pp. 1154-55.

German-International Directory of Cement, Lime and Gypsum Industry. A revised 300-page directory of the cement, lime and gypsum industry has recently been published by *Der Bau-Kurier,* Berlin-Charlottenburg 2, Germany, a copy of which, bound in cloth, may be obtained for 15 R.M. or $3.58. This directory contains a list of addresses with directory of officials of the scientific, manufacturing, sales, consumers and labor associations of the German cement, lime, gypsum and aggregate industries. Then follows a list of the German cement plants, classified by district associations, followed by an alphabetical listing of the towns; and then by general data, illustrations and trade marks of these cement plants. This is followed by a directory of the names and addresses of the German lime and gypsum plants. The last section of the book comprises a listing of the foreign cement plants by continents and by countries, including also the scientific associations. The foreign lime and gypsum plants are not listed, nor the periodicals of the cement, lime and gypsum industry, and the American list of cement plants is out of date.

Improvement in Slurry Mixer and Stirrer. A. Vogt states that the cost of stirring and mixing of more or less viscous slurry is such an important item in the cement industry that its reduction may be considered an economic advance. He describes a compressed-air mixer of simple requirements and exceptionally low operating costs. The mixing tank *a* comprises a round cylinder or shaft of reinforced concrete, with a conical floor in the base of which a shaped piece *b* is inserted for introducing and distributing the compressed air. A riser tube *c* of considerable internal diameter is suspended or placed concentrically into this tank; the upper edge of this riser tube (or the riser tube may have rows of closable perforations) being always located just beneath the surface of the slurry.

Arrangement of the compressed-air operated slurry mixer and stirrer

Einschuettraum der Trockenmassen = charging space for the dry materials.
Grobmaschiges Sieb mit Rahmen = coarse mesh screen with frame.
Steigrohr = riser tube.
Verschlusspropfen f = stop cock f.
Einsteig-Schraegschacht = inclined shaft for access.
Pressluft = compressed air.
Masstab = scale in meters.

If the tank is to be used not only for constant stirring, but also for admixing dry material to the slurry in the tank, a cylindrical screen *d* properly braced is built concentrically in this tank. When the tank is filled with slurry to above the riser tube *c* (or the side openings), and compressed air is supplied to the slurry from below through the shaped piece *b,* the air bubbles which rise within the tube *c* decrease the specific gravity of the slurry in the tube *c,* as compared to the slurry outside of the riser tube, so that an upward movement of the slurry is started and maintained in the riser tube *c,* with a consequent downward flow outside of the riser tube. Thus the air supply effects a stirring of the entire slurry content of tank *a.*

During the stirring the additive material supplied in the intermediate space between the tank *a* and the cylindrical screen *d* descends slowly so that it slips gradually through the screen-shell *d* into the space between *c* and *d,* where it enters into the movement of the slurry and is thus mixed intimately with the slurry. Then the slurry is drawn, as needed, through the slide and the discharge pipe *e.* Moreover, this discharge pipe may be opened or closed periodically by means of the stopper *f* inserted from above. The slide *e* is accessible by way of the inclined shaft *g,* in which the discharge pipe may be installed if desired.—*Zement* (1930) **19**, 34, pp. 809-810.

Italy's Rock Products Industry. R. Deckert reviews the Italian cement, lime and gypsum industry. Italy has 140 cement companies which operate all told 150 plants with 800 kilns and more than 20,000 workers. The Italian raw material for natural cement is of such exceptional quality that in 1928, for example, about 55% of the entire cement production was natural cement, but of late its production is decreasing in favor of portland cement. The Italian cement plants produce cements of every kind, namely, rapid hardening and slow hardening, white, colored, special, puzzuolanic, granite, alumina, blast furnace and resistible. About three and one-half million tons of cement were produced in 1929. Italy's export of cement has increased considerably, amounting to nearly 31,000 tons in 1929, but the import is also increasing again, being nearly 16,000 tons in 1929. The export cement is carried mostly by ship to the neighboring countries.

The production of cement products has increased considerably, there being 2440 firms represented in this industry, employing nearly 21,800 persons, ranging anywhere from 1 to 856 employes per company. The Italian cement plants have recently combined into a government association entitled Federazione Nationale Fascista Industria del Cemento, Calce e Gesso, which includes also manufacturers of lime and gypsum.

Italy has 586 lime plants which are op-

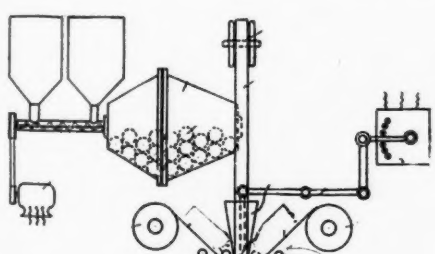
erated by 518 lime companies and have all told 1000 kilns and 6000 workers. About one and one-half million tons of lime is produced annually. There are only a few gypsum plants, there being 107 companies with 115 plants and 130 kilns employing about 1000 workers. The production was nearly 400,000 tons in 1929. About 1000 tons each of burned and raw plaster was imported and the export amounted to nearly 23,000 tons of raw gypsum and 1000 tons of burned gypsum, which is a considerable increase over the previous year. Most of the Italian rock products industry is concentrated in Lombardei, Piemont and Toscana. —*Tonindustrie-Zeitung* (1930) **54**, 71, pp. 1229-1230.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

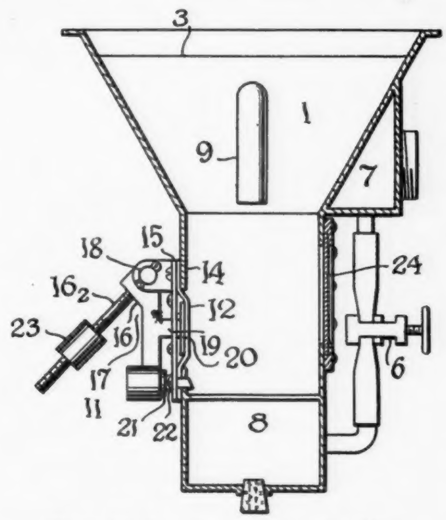
Plasterboard Manufacture. The inventor describes a continuous process of manufacturing gypsum wallboard by pouring the gypsum between vertically and downwardly moving paper cover sheets. He also describes the machinery to be used in connection with his process.

Prior to this invention, practically all wallboard plants used a process and machine wherein the plastic material was poured on to a horizontally running, continuous sheet of paper. Later and as a second step in the process the board received its top cover paper from a horizontally mounted spool of paper. In this novel process the top and bottom paper receive the stucco, while in the vertical position and as the fresh board moves downward, the setting process is completed, and the board passed between the forming rolls. The accompanying line cut illustrates the principal clearly.—*A. J. Meier, assignor to Rockwood Corp., U. S. Patent No.* 1,749,436.



The plasterboard is formed while in the vertical position

Hindered Settling Classifier. The inventor of the well-known Fahrenwald classifier has invented a new device which accomplishes the same ends in a somewhat simpler way. The outstanding feature of both machines is that the pulp (mixture of sand and water) in the hindered settling chamber is maintained at a constant specific gravity. In the older machine the pulp is balanced against a column of clear water which operates a valve mechanism and lets out some of the sand when the specific gravity is too high. In the new device the direct pressure of the pulp does the same thing.

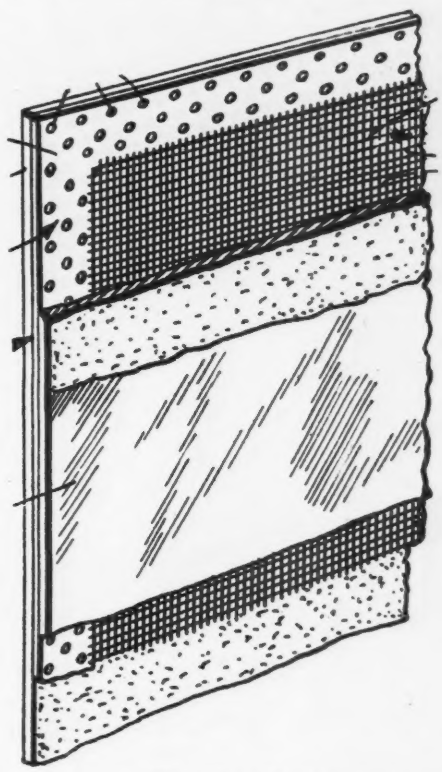


New hindered settling classifier

The sand discharge is at the side of the hindered settling column and it is closed by a valve on a lever arm. A projection on this arm presses against a flexible diaphragm which sustains the pressure of the pulp. When the weight of the pulp is sufficient the pressure against the diaphragm thus causes the discharge valve to open.

Two other features are included in the patent. One is an auxiliary overflow, a pipe which dips into the settling chamber of the classifier and discharges at a lower point than the overflow weir. This takes out fine sand which is too heavy to go over the weir and too light to fall through the hindered settling column. Without this pipe the inventor says the discharge will open prematurely. The other feature is the opening through which the hydraulic water enters the hindered settling chamber. It is made by a series of bars and slots and the inventor claims that this prevents the formation of "dead beds."—*A. W. Fahrenwald, U. S. Patent No.* 1,572,791.

Plasterboard Construction. The inventor describes a plaster wallboard consisting essentially of a wire screen embedded in the plaster material. *Otho V. Kean. U. S. Patent No.* 1,761,730.



Plaster wallboard with wire screen reinforcements

Cellular Structural Material. The inventors describe a cellular gypsum product consisting of calcined gypsum, a carbonate yielding an alkaline reaction on adding water (such as sodium carbonate) and a metal salt such as copper sulphate. The metal salt gives with water an acid reaction which reacts with the carbonate forming gaseous carbon dioxide. In the reaction a copper compound is precipitated upon the interfaces of the gas cell walls.—*Harry E. Brookby and George D. King, assignors to United States Gypsum Co. U. S. Patent No.* 1,764,824.

Refractory Material. The patent is intended to cover a fired ceramic refractory material of the non-vitreous type having a porosity greater than porcelain. The author proposes to use, for example, 45 parts by weight of a sized cyanite concentrate of approximately 28-mesh, 23 parts by weight of minus 200-mesh cyanite concentrate, and 32 parts of Georgia bauxitic clay. He describes, in a general way, how he proposes to manipulate this ceramic material to get the results he desires.—*Harold C. Harrison, assignor to McLanahan-Watkins Co. U. S. Patent No.* 1,760,133.

New Machinery and Equipment

Power Washer for Cleaning Out Ready-Mixed Concrete Trucks

THE CURTIS PNEUMATIC MACHINERY CO., St. Louis, Mo., is manufacturing a hydraulic washer with silent enclosed pump specifically designed for car washing, which is readily adapted for washing out ready-mixed concrete trucks.

The pump, state the manufacturers, is not simply an ordinary industrial pump adapted to a car washer. It is of the slow-speed, 3-cylinder type, which permits it to furnish even water pressure. The pump is lubricated by a flooded and direct self-oiling system, and does not require frequent oiling.

Hydraulic washer for cleaning ready-mixed concrete trucks

A multiple, automobile type V-belt drive from motor to pump, it is claimed, eliminates noisy chains and the shutdowns which often result from broken chain or sprockets. The pump is internally gear-driven by cut gears.

The automatic pressure governor bypasses the water over 300 lb. pressure, and this, it is stated, and an additional safety pop valve, provide precaution against excess pressure backing up in water lines and blowing off plumbing fixtures.

The gun is the self-shut-off type with a simple locking device for chassis or body washing position. The nozzle disc is of special alloy steel, rust-resisting and double-heat treated.

The Curtis washer is entirely metal, has no wood to become wet or rot, and it is made in standard one- and two-gun units and an oversize two-gun unit.

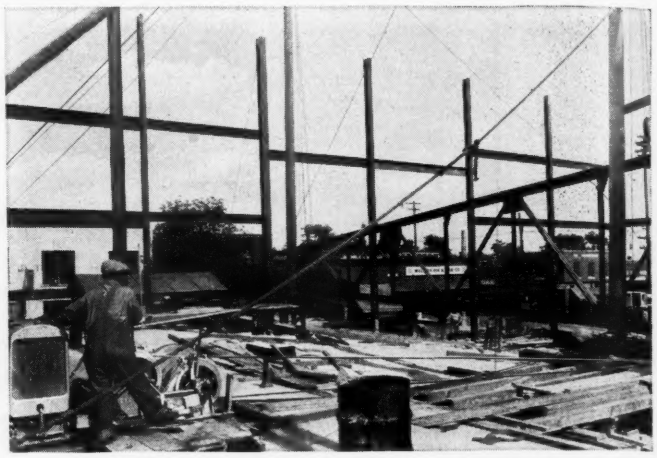
New Hoists Built with Single and Double Drum

A LINE OF Timken roller-bearing thrust hoists built in two models, single and double drum, and ranging from 10-hp. to 50-hp., is being marketed by the Jaeger Machine Co., Columbus, Ohio.

According to the manufacturer, the unit is rugged, simple and economical to operate. Featherweight controls and positive brakes enable the operator to set the truss in exact position. Friction is attained by the positive thrust action, using Gadtke asbestos compound blocks, and friction return and release are attained by the same screw action of the thrust. In this way thrust and release springs are entirely eliminated.

The accompanying illustration shows a 32-hp. Timken thrust hoist being used to erect steel trusses in connection with two gin poles, one drum line leading to each pole.

These outfits, state the manufacturers, are being used in gravel pits for dragline hauls, for material hoisting and by bridge builders for pile driving.



A 32-hp. thrust hoist being used to erect steel trusses in connection with two gin poles

Crawler Type Loader

NEW ENGLAND ROAD MACHINERY CO., South Boston, Mass., has built a new crawler type loader for the handling of sand, gravel and stone in large quantities.

The height of the loader in working position is 16 ft. 6 in. and it is 19 ft. long. When lowered for transportation it measures 12 ft. 5 in. high and 22 ft. long. A pair of 2-in. adjusting screws permits the raising and lowering of the elevator by the turning of a hand-wheel within reach of the operator's platform.

The machine has three speeds forward and one in reverse. The forward speeds range from 16 ft. to 77 ft. per minute, while the feeding speed is approximately 13 ft. per minute, and it is claimed that this loader is one of the fastest machines of its type in moving from one position to another, or when crowding into the stockpile or gravel bank. The elevator and crawler work independent of each other, and it is therefore possible to stop the elevator while moving or keep it working while crowding into the material to be loaded. The crawler pads are 12 in. wide, of alloy steel and are of self-cleaning design.

The feeding device is in the form of a continuous screw. The adjustable loading chute can be raised or lowered from the operator's platform, and can be locked in position. As the chute is attached on a swivel base, it can also be swung around on either side to any angle, facilitating loading under the most unfavorable conditions.

The buckets are 20 in. wide and when level full with materials will load wagons or trucks at the rate of 2 yd. per minute. They are made of malleable iron and heavily ribbed.

A power unit of approximately 40-hp. is used to operate the loader.

New loader for sand, gravel and stone

The framework of the machine is welded into one solid piece of metal, which, it is said, prevents twisting or moving while the machine is in operation.

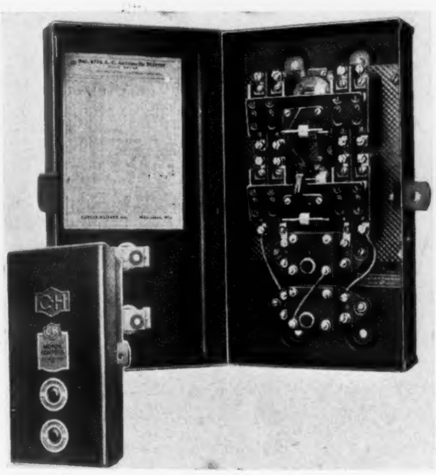
Machinery Manufacturer Opens Buffalo Office

SPROUT, WALDRON AND CO., Muncy, Penn., manufacturers of a line of material handling equipment and special machinery for the process and other industries, has opened an office in Buffalo, N. Y.

The office is located at 725 Genesee Bldg., Buffalo, and F. R. Snodgrass, who comes to Buffalo direct from the home office, has been placed in charge.

Automatic Starters for Squirrel Cage Motors

A NEW LINE of enclosed automatic motor starters for two-speed separate winding type squirrel cage motors is announced by Cutler-Hammer, Inc., Milwaukee, Wis.



Automatic motor starter

These starters are the across-the-line type, the windings being connected directly to the line. Both windings are protected against dangerous overloads by means of Cutler-Hammer thermal overload relays, and a push-button master switch with "stop," "low" and "high" buttons is used to obtain control from a remote point.

The starters are made in three types—for starting on either winding, with sequence compelling feature, or with automatic sequence control relay. For starting on either winding, depressing either the "low" or "high" button starts the motor on the respective "low" or "high" speed winding. The sequence compelling feature requires that the motor always be started at low speed before transferring to high speed. The automatic sequence control relay insures that the motor will always start at low speed and pass to high speed automatically if the "high" button is depressed. On all three types, if the motor is operating at one speed it can be transferred to the other speed by simply depressing the other speed button—it is not necessary to stop the motor.

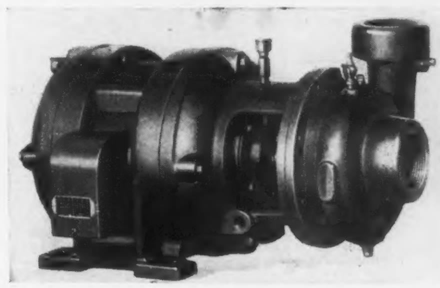
The mechanism, which consists of two magnetic contactors mechanically interlocked and two sets of thermal overload relays (one for each winding), is mounted in a split type enclosing case which, when opened, provides easy access to the various operating parts. Ample wiring space and conduit knockout holes for any size conduit which might be used make installation and wiring easy.

"Slope Hoist" Motor Installation

THE WESTINGHOUSE ELECTRIC and Manufacturing Co., East Pittsburgh, Penn., recently sold a 350-hp. hoist motor to the Lehigh Valley Coal Co. This motor is a standard, wound-rotor, Type CW, 3-phase, 60-cycle, 2300-volt, open frame, horizontal type motor.

The hoist is for a slope inside of mines to move coal from one vein level to another.

The control equipment is generally similar to the standard Westinghouse Class 13-700 control. The speed of the hoist may be controlled in the lowering direction by moving the controller handle from the last point lowering to points intermediate between the last point and the "off" position. The motor stator connections are reversed and on this point a large amount of resistance is inserted in the rotor circuit. This gives a light plugging operation and their lowering load will continue to predominate and overhaul the motor. The tendency, however, is for the hoist on this point of the control to decrease its speed, and to further decrease the speed the controller is notched toward the "off" position one point at a time until sufficient resistance is cut out of the secondary or rotor circuit to further slow it and the hoist to a lower speed. In this way the speed of the hoist may be controlled but usually in lowering the load, the load is allowed to overhaul the motor and give regeneration for most of the distance, while the controller is on the last point lowering position. Then, when it is desired to bring the hoist to rest the controller is notched toward the "off" position to a point which will give a heavy plugging operation.



Pumping unit with 3500 r.p.m. motor

Centrifugal Pumping Units

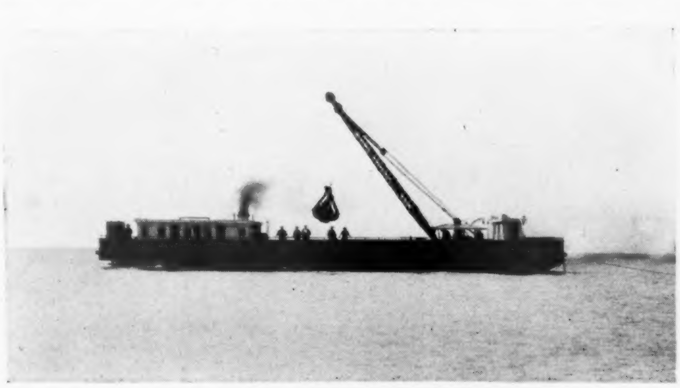
THE ALLIS-CHALMERS Manufacturing Co., Milwaukee, Wis., announces an extension to cover three new sizes in its line of "SSU" centrifugal pumping units of single-shaft, two-bearing design, which now includes ratings from 30 to 500 gallons per minute for heads under 100 ft. Recent adoption of total enclosure of motor housings on the pump end of these units and the use of totally enclosed fan-cooled motors, if necessary, permits their use for severe service.

Clamshell Bucket Dredge

THE accompanying illustration shows the all steel self propelling clamshell bucket dredge built by Maddox Foundry and Machine Co., Archer, Fla., for Bermudez Bros. of Havana, Cuba.

The dredge has a 200-hp. triple expansion propelling engine, a 50-cu. ft. bucket, 15-ton crane and a 46-ft. boom.

It is used for reclaiming sand in water 100 ft. deep.



All steel clamshell bucket dredge

Addendum

THE EDITOR slipped in his review of "Air Compressors" in the January 3 Annual Review issue of ROCK PRODUCTS, page 179, where it was stated that: "For once we find nothing new in air compressors."

We have been reminded that in our January 18, 1930, issue we published a description of a genuinely new and novel type of rotary air compressor, so far as this country is concerned, originally of French design, introduced in this country and Canada by the Fuller Co. and used by it in a number of its most recent Fuller-Kinyon cement pump installations.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Estimating Quantities for Concrete†

By Stanton Walker
Director, Engineering and Research Division, National Sand and Gravel Association

ACCURATE methods for estimating quantities of materials for concrete are of particular interest to ready-mixed-concrete operators. The need for a dependable method is of even greater importance to him than to his contemporary, the contractor. Ready-mixed concrete may be furnished in relatively small lots and cumulative errors may reach important amounts; the ready-mixed concrete operator does not have the same opportunities as the contractor to compare quantities of materials with the progress of the work and to make the necessary adjustments in proportions. Ready-mixed concrete is sold on a small margin of profit over actual cost of materials, mixing and hauling, and, therefore, accurate knowledge of cost is essential; the materials constitute a most important part of the cost of the finished product.

Several formulas have been proposed and a number of different tables have been computed to assist the engineer in estimating quantities of cement and aggregate for concrete. Certain of these tables and formulas give quite accurate results, while others lack accuracy or flexibility, or both, due to efforts to attain simplicity. Many such formulas and tables fail to take into account the part played by the mixing water and therefore may be used only for rough estimates of average conditions.

This paper outlines a simple and easily-understood method for computing the quantities of materials required for a given volume of concrete or the volume of concrete produced by given quantities of materials. It discusses briefly methods for obtaining information necessary for making the computations. It shows comparisons between the results obtained by estimation and actual measurement and gives examples of calculations for typical cases.

Basis of Method

The method described has for its basis the obvious fact that the volume of freshly mixed concrete is equal to the summation of the volumes occupied by the solid aggregate, solid cement, water, entrained air, and unfilled void spaces. It is applicable with equal accuracy to different types of aggregates. The method is neither new nor revolutionary; it has been described in the literature* and is based on sound fundamental facts.

The volume of hardened concrete will, so far as practical considerations are concerned, be the same as that of freshly mixed concrete, except for loss of entrained air and mixing water. Properly proportioned concrete contains a negligible quantity of entrained air and unfilled void spaces; loss of water through the forms in sufficient amounts to affect the practical accuracy of the calculations will occur only from overwet mixes. Even in cases where entrained air is present in sufficient quantities to affect the apparent volume of concrete, the error will not be important when the volume of concrete in place is considered. Entrained air will be lost in transit and during the placing of the concrete in the forms, and, therefore, the volume of concrete in place will conform to the original estimates. Any error which may occur on account of loss of water tends to have something of a disciplinary effect on the operator; the volume of concrete in the forms would be less than estimated. Concrete should not be mixed wet enough so that this loss is an important amount, and, if it is, the operator deserves the penalty of the reduced volumes. Unfilled voids must not be permitted in concrete of good quality. These factors, therefore, are ignored in the method of calculation which is outlined. The method gives results accurate within 2 or 3% so long as:

1. The concrete is plastic and workable and all voids in the aggregate are filled with cement paste.

2. No water is lost, as in the case of extremely wet mixtures.

3. No important amount of air is entrained as in the case of very dry and lean mixtures and of mixtures of extremely fine aggregate.

The determination of the volume of concrete produced by given quantities of materials consists, therefore, of the simple addition of the following factors:

1. Volume of mixing water (including surface moisture in aggregates).
2. Volume of solids in cement.
3. Volume of solids in fine aggregate.
4. Volume of solids in coarse aggregate.

Since the estimation of quantities for concrete consists of this simple addition and variations of it, it remains only to gain a clear understanding of what these factors are and how to obtain them.

Solid Volumes

Probably the simplest description of the volume of solids is to say that it is the complement of the void content; if an aggregate contains 35% of voids, then each cubic foot of it contains 0.65 cu. ft. of solids. While this statement of solid volumes serves very well for the purpose of illustration, a more general statement will lead to a better and more flexible understanding of their use. It is that the volume of solids in a given amount of any material is equal to its weight divided by the weight of a unit volume of the solid material. The weight of a unit volume of solids is easiest determined by multiplying the weight of a unit volume of water by the specific gravity of the material. Specific gravity, as you all know, is the ratio of the weight of a given solid volume of the material in question to the weight of a like volume of water. For example, water weighs 62.5 lb. per cu. ft., for average conditions of temperature; therefore, a substance with a specific gravity of 2.00 will have a weight of solids of 125 lb. per cu. ft.

Some further discussion of solid volumes and specific gravity, and the conditions under which they are to be determined, is necessary in order to make clear the application of the method of calculation to all conditions. Before proceeding with it and while we have the fundamentals in mind, let us consider an example of applying the

†Paper given before the convention of the National Ready-Mixed Concrete Association, St. Louis, Mo., January 26.

*See Bulletins 1 and 4, "Estimating Quantities of Materials for Concrete" and "Tables of Quantities of Materials for Concrete," of the National Sand and Gravel Association, and "Design and Control of Concrete Mixtures," by the Portland Cement Association.

method. Suppose it is desired to know the volume of concrete which will be produced by the following quantities:

Cement	564 lb.
Water (including surface moisture in aggregates)	35 gal.
Fine aggregate	1200 lb.
Coarse aggregate	2500 lb.

For the purpose of this example, assume that the specific gravities of the materials are the following:

Cement	3.1
Fine aggregate	2.5
Coarse aggregate	2.7

Then the weight per cubic foot of solids for each is,

Cement, $3.1 \times 62.5 = 193.6$ lb. per cu. ft.
Fine aggregate, $2.5 \times 62.5 = 156.2$ lb. per cu. ft.
Coarse aggregate, $2.7 \times 62.5 = 168.6$ lb. per cu. ft.

From this it follows that the solid volumes of material in the batch are,

$$\text{Cement, } \frac{564}{193.6} = 2.91 \text{ cu. ft.}$$

$$\text{Water, } \frac{35 \text{ gal.}}{7.5} = 4.67 \text{ cu. ft.}$$

$$\text{Fine aggregate, } \frac{1200}{156.2} = 7.58 \text{ cu. ft.}$$

$$\text{Coarse aggregate, } \frac{2500}{168.6} = 14.83 \text{ cu. ft.}$$

Thus the total volume of the batch is 29.91 cu. ft. of concrete.

Determination of Solid Volumes

The most convenient application of this method of computation requires that the proportions of the materials for the concrete be expressed in terms of weight. By this, I do not mean that the specification may not read in any one of the several different ways which are commonly employed, but that whatever method is used should be reduced to terms of weights. The following gives a brief discussion of each of the factors involved in the computations of quantities which should make their application clear.

CEMENT. For all practical purposes it is sufficiently accurate to consider the specific gravity of cement at 3.1 and, consequently, the weight per cu. ft. of solids as 193.6 lb. On this basis, each sack of cement has a solid volume of 0.485 cu. ft. and each 100 lb., a solid volume of 0.516 cu. ft. If an actual determination of the specific gravity of cement is required, it should be made by an experienced operator; any cement manufacturer will furnish you with this information concerning his product.

MIXING WATER. The quantity of water used in the calculations must take into account the surface moisture of the aggregates, or, in the event of a dry absorbent aggregate, the water absorbed by it. Reference to methods for determining moisture content and absorption will be discussed later. These factors must not be overlooked if accurate results are to be obtained, since they form an important part of the mixing water. For example, 1000 lb. of sand of the average moisture content may contain about 5 gal. of water.

PROPORTIONS. Specifications are not uniform in their method of stating proportions for concrete. Several different methods are used, of which the following are the most common:

1. Moist and loose volumes.
2. Inundated volumes of sand and loose volumes of coarse aggregate.
3. Dry and loose volumes.
4. Dry and rodded volumes.
5. Dry weights.
6. Wet weights.
7. Weight of saturated-surface-dry material.

The last named method is recommended for your consideration as the most convenient standard to adopt. Except where fairly absorbent aggregates are used, the "saturated-surface-dry" weights do not differ materially from the dry weights. The most direct method of applying the method of calculation outlined in this paper to each of the methods of stating proportions given above could be outlined. However, it is believed that this would lead to confusion and would not be of particular interest since it is equally convenient to reduce any statement of proportions to terms of "saturated-surface-dry" weights and to proceed with the calculations on that basis. For strict accuracy, it is necessary to use this weight or else to make corrections in other respects which will bring about the same results.

Moist and loose volumes may be expressed in terms of saturated-surface-dry weights from a knowledge of the weight per cubic foot of the moist and loose material, measured in a manner identical to that used in the proportioning, and a knowledge of the amount of surface moisture. For example, a 1-2-4 mix, in terms of moist and loose volume, may be expressed in terms of weight if the following information is known: (1) weight per cubic foot of cement (in the United States practically always assumed as 94 lb. per cubic foot); (2) weight per cubic foot of moist and loose aggregates, and (3) surface moisture of aggregates.

To illustrate the method, assume the following data:

Weight per cu. ft. of fine aggregate, moist and loose	88 lb.
Weight per cu. ft. of coarse aggregate, moist and loose	100 lb.
Surface moisture of fine aggregate	4%
Surface moisture of coarse aggregate	negligible

The proportions in terms of moist aggregates are, therefore, 94 lb. of cement, 176 lb. of sand, and 400 lb. of coarse aggregate. Deducting the 4% of surface moisture from the sand, the proportions are:

94 lb. of cement
169.4 lb. of saturated-surface-dry sand
400.0 lb. of saturated-surface-dry coarse aggregate.

Or, the proportions may be expressed as 1-1.8-4.15, in terms of saturated-surface-dry weight.

The reduction of the other volume of proportion to terms of weight is done in an exactly similar manner, except that in the case of the dry volumes, the amount of water which will be absorbed by the aggregates should be added to the weights used in the calculations.

To change proportions stated in terms of wet weights or dry weights to terms of saturated-surface-dry weights, the surface moisture should be deducted or the water of absorption added, as the circumstances require.

SPECIFIC GRAVITY. Values of specific gravity for a given material may vary somewhat, depending on the method of determination. The various values most commonly referred to are "true" specific gravity, "apparent" specific gravity of dry aggregates, and specific gravity of saturated-surface-dry aggregates. The use of any of these values, with the proper understanding, will give identical results. For direct use in the method of calculation outlined, the specific gravity of the saturated-surface-dry aggregates is required.

Specific gravity of materials from a given source may be expected to be quite constant. Therefore, it is suggested that the value of specific gravity which is to be used in your computations be determined by an experienced operator in a laboratory. It should be specified that he furnish you with the specific gravity of the saturated-surface-dry materials. The method for determining specific gravity is not so complicated but what you can carry it out with entirely satisfactory accuracy by means of the several methods which have been outlined.† These methods require special apparatus. A simple method requiring a minimum of apparatus and which may be expected to give reasonably accurate results is the following:

Calibrate a container of about 1 cu. ft. capacity by measuring the weight of water required to fill it to a mark. Place a weighed quantity of saturated-surface-dry aggregates in the empty measure, of sufficient quantity to about half fill the measure. Weigh out a quantity of water which will exactly fill the measure and from this measured quantity add water to the measure containing the aggregate until it is filled to the calibration mark. While adding the water, stir the aggregates thoroughly to eliminate entrained air. Determine the weight of water remaining. This weight divided into the weight of the aggregates is the specific gravity of the saturated-surface-dry aggregate. For example, assume a measure of such a size that, when filled to the calibra-

†See "Tentative Method of Test for Field Determination of Approximate, Apparent Specific Gravity of Fine Aggregate" (Serial Designation: C 68-27 T), Proc. Am. Soc. Testing Mats. 1927, Pt. I, and "Test for Apparent Specific Gravity of Coarse Aggregate (D 30-18) A. S. T. M. Standards, 1927, Pt. II.

tion mark, it will hold 60 lb. of water. In another container, weigh out 60 lb. of water and to the calibrated container add, say, 25 lb. of saturated-surface-dry aggregate. From the 60 lb. of water, add water to the container until it is filled to mark, after carefully stirring out the entrained air. If the amount of water remaining after filling the measure is 10 lb., then the specific gravity of the aggregates is 25 divided by 10, or 2.5.

MOISTURE CONTENT. The percentage of moisture may be most directly determined by drying a weighed sample of the aggregate to a saturated-surface-dry condition and determining the loss in weight. The loss should be expressed as a percentage of the saturated-surface-dry weight. In the case of sand, the saturated-surface-dry condition should be considered as reached when it will flow freely and exhibit no water on the surface. A quick and convenient method of drying aggregate by pouring alcohol over it and igniting the alcohol is described in the "Concrete Primer" by F. R. McMillan, 1928 Proceedings, American Concrete Institute. Several methods for determining the moisture content of sand from a knowledge of the specific gravity and without drying it are described in the literature. Time will not be taken to describe them here, but you will be interested in the following list of published information concerning these methods:

"Tentative Method of Test for Field Determination of Surface Moisture in Fine Aggregate" (Serial Designation: C 70-27 T), Proc. Am. Soc. Testing Mats., 1927, Pt. I.

"Determination of Moisture in Sand and Gravel," July 1927, issue *National Sand and Gravel Bulletin*, p. 19.

"Determination of Moisture in Aggregates," November 1927, issue *National Sand and Gravel Bulletin.*

"Sand Testing Flask," by Cloyd M. Chapman, May 1928, issue *National Sand and Gravel Bulletin.*

"Comparison of Methods of Determining Moisture in Sands," by William R. Johnson, Proc. Am. Conc. Institute, 1929.

ABSORPTION. Fine aggregates practically always contain moisture and, therefore, it will not be necessary, ordinarily, to determine their absorption. The determination of absorption of fine aggregates is somewhat difficult, and methods for doing it are not well standardized. If the information is required, it should be obtained by a competent operator in a well organized laboratory. No attempt will be made to describe the methods here. The absorption of coarse aggregates can be readily determined by anyone with simple equipment available. It consists merely of immersing a weighed sample of dried aggregate in water, allowing it to remain for a specified period, removing it and carefully surface-drying with a towel, and determining the gain in weight. A value of absorption after a period of 30 minutes is recommended as being most suitable for the purpose of these calculations.

Examples of Calculations

The two examples which follow should make clear the application of the method to problems of various types.

PROBLEM NO. 1. What quantities of materials will be required for a cubic yard of 1-2-4 concrete, where the proportions are stated in terms of moist and loose volume?

DATA REQUIRED

Fine aggregate, weight per cu. ft. (moist and loose)	90 lb.
Fine aggregate, specific gravity (saturated-surface-dry)	2.6
Fine aggregate, surface moisture	5.0%
Coarse aggregate, weight per cu. ft. (moist and loose)	100 lb.
Coarse aggregate, specific gravity (saturated-surface-dry)	2.7
Coarse aggregate, surface moisture	2.0%

Quantity of mixing water added at mixer, 5 gal. per sack of cement.

CALCULATIONS

The quantities for a one-sack batch in terms of moist weights are:

Cement, 1 sack	= 94 lb.
Fine aggregate, 2 cu. ft.	= 180 lb.
Coarse aggregate, 4 cu. ft.	= 400 lb.

Since the fine aggregate contains 5% of moisture (based on the saturated-surface-dry weight), the weight of saturated-surface-dry fine aggregate is $\dfrac{180}{1.05} = 171.5$ lb.

Similarly, the weight of saturated-surface-dry coarse aggregate is $\dfrac{400}{1.02} = 392$ lb.

From this it may be seen that the amount of fine aggregate used with one sack of cement contains 8.5 lb. of water and the coarse aggregate 8 lb. Therefore, the total quantity of mixing water, including the moisture in the aggregates is 5 gallons plus 8.5 lb. plus 8 lb., or,

$$41.65 + 8.5 + 8.0 = 58.15 \text{ lb.}$$

Then for the purposes of our calculations, the quantities for a one-sack batch may be expressed as follows in terms of saturated-surface-dry weights:

Cement	94 lb.
Fine aggregate	171.5 lb.
Coarse aggregate	392.0 lb.
Water	58.15 lb.

The weights per cubic foot of solid volumes of the materials may be calculated as follows:

Cement, (see previous discussion)	= 193.6 lb.
Fine aggregate, 62.5 × 2.6	= 162.5 lb.
Coarse aggregate, 62.5 × 2.7	= 168.6 lb.
Water,	= 62.5 lb.

Therefore, the solid volumes in the above batch are:

$$\text{Cement,}\quad \frac{94}{193.6} = 0.485 \text{ cu. ft.}$$

$$\text{Fine aggregate,}\quad \frac{171.5}{162.5} = 1.055 \text{ cu. ft.}$$

$$\text{Coarse aggregate,}\quad \frac{392.0}{168.6} = 2.325 \text{ cu. ft.}$$

$$\text{Water,}\quad \frac{58.15}{62.5} = 0.93 \text{ cu. ft.}$$

Volume of one-sack batch ...... = 4.795 cu. ft.

The number of batches required to produce 1 cu. yd. of concrete (27 cu. ft.) is $\dfrac{27}{4.795} = 5.63$ one-sack batches. Therefore, the quantities per cu. yd. of concrete, in terms of saturated-surface-dry aggregates, are the following:

Cement, 5.63 × 94 lb.	= 529 lb.
Fine aggregate, 5.63 × 171.5 lb.	= 966 lb.
Coarse aggregate, 5.63 × 392.0 lb.	= 2205 lb.
Water, 5.63 × 58.15 lb.	= 327 lb.
Total	= 4027 lb.

In terms of moist weights they are:

Cement, 5.63 × 94 lb.	= 529 lb.
Fine aggregate, 5.63 × 180 lb.	= 1014 lb.
Coarse aggregate, 5.63 × 400 lb.	= 2250 lb.
Water, 5.63 × 5 gal. × 8.33 lb.	= 234 lb.
Total	= 4027 lb.

PROBLEM NO. 2. What quantities of fine and coarse aggregate will be required to produce one cubic yard of concrete which specifications require to contain 6 sacks of cement for each cubic yard, a consistency represented by a slump of 3 to 4 inches, and the fine and coarse aggregates in the proportions of 1 to 2 by weight?

The accurate solution of this problem will require some cut and try. The quantity of mixing water has not been stated, so in our preliminary calculations we must assume a reasonable quantity and learn from experience if it is correct; if it is not, a correction in the quantities should be made.

For the purpose of this example, assume the following information concerning the aggregates:

Fine aggregate, specific gravity, saturated-surface-dry	2.6
Fine aggregate, surface moisture	5.0%
Coarse aggregate, specific gravity, saturated-surface-dry	2.7
Coarse aggregate, surface moisture	2.0%

The quantity of mixing water, including moisture in the aggregate, can be guessed quite accurately for the first calculations by the experienced operator. For these calculations assume 6 gallons per sack of cement.

From the specification and the assumptions as to water, we can at once determine the volume occupied by the solid aggregates. The solid volume of 6 sacks of cement is 6 × 0.485 = 2.91 cu. ft. (See previous discussion). The volume occupied by the water is 36 gallons (for six sacks of cement) or 4.8 cu. ft. Therefore, the cement and water occupy 2.91 plus 4.8, or 7.71 cu. ft. of space. The solid aggregate must, therefore, occupy 27—7.71 or 19.29 cu. ft.

No important error will be introduced by assuming that one-third of this solid volume consists of fine aggregate and two-thirds of coarse aggregate, since it is specified that the proportions by weight are 1 to 2. However, since the specific gravities are different, a small error is introduced by this assumption and it will be well to show how to express these proportions in terms of solid volumes. It may be done as follows:

$\frac{1}{2.6}$ is a function of the solid volume of the fine aggregate and $\frac{2}{2.7}$ is a function of the solid volume of the coarse aggregate. Therefore, in terms of solid volumes the proportions are $\frac{1}{2.6}$ to $\frac{2}{2.7}$, or 0.385 to 0.741, or 1 to 1.925. From this it follows, of course, that the ratio of solid volume of fine aggregate to solid volume of total aggregate is

$$\frac{1}{1 + 1.925} = .342.$$

Therefore, of the 19.29 cu. ft. of solid aggregate, 34.2% is fine and 65.8% is coarse, or

6.6 cu. ft. of solid fine aggregate, and
12.69 cu. ft. of solid coarse aggregate

From the specific gravities we can compute the saturated-surface-dry weight per cubic foot of solid materials as follows:

Fine aggregate,
$62.5 \times 2.6 = 162.5$ lb. per cu. ft.

Coarse aggregate,
$62.5 \times 2.7 = 168.6$ lb. per cu. ft.

Therefore, 6.6 cu. ft. of solid fine aggregate weighs $6.6 \times 162.5 = 1072$ lb. and 12.69 cu. ft. of solid coarse aggregate weighs $12.69 \times 168.6 = 2140$ lb.

The expression of the quantities in terms of the moist materials involves one more easy step. The weight of moist fine aggregate is $1072 \times 1.05 = 1127$ lb., since the moisture is 5%. Similarly, the weight of moist coarse aggregate is $2140 \times 1.02 = 2182$ lb. From this it will be seen that there is a total of 97 lb. of water (55 + 42) or 11.6 gal. of water in the aggregate. Therefore, the quantity of water added at the mixer should be 36 gal. less this amount, or 24.4 gal. for each cubic yard of concrete.

If it develops that the mix is too wet, of course the water should be reduced and the quantities of aggregates increased a corresponding amount; similarly, if it is too dry, a correction should be made. An error of 2 gal. in the total water introduces an error in quantities per cubic yard of only about 1%.

Computation Charts

Charts of various types may be constructed which will facilitate the computations. Three are included here, which will suggest types of charts which may be drawn to fit your most common problems.

Fig. 1 is designed particularly to assist in the determination of the volume produced by one-sack batches of concrete of various proportions and the number of such batches required to produce a cubic yard of concrete. If the saturated-surface-dry weights of the aggregates used with each sack of cement are known, theid solid volumes may be determined from the lower diagram. Adding the solid volumes of the fine and coarse aggregate and referring it to the upper diagram permits of the determination of the volume of concrete produced by a one-sack batch and the number of one-sack batches required for 1 cu. yd. of concrete if the gallons of mixing water per sack of cement are known.

Fig. 2 is designed to facilitate calculations when the quantity of cement and gallons of mixing water per sack of cement are specified. (Similar to Problem No. 2 discussed previously.) For example, if 600 lb. of cement per cubic yard of concrete and 6 gal. of water per sack of cement are specified, the upper diagram shows that 18.80 cu. ft. of solid aggregate are required for each cubic yard of concrete. If the specific gravities and proportions of fine to coarse are known, the weights of saturated-surface dry materials may be determined from the lower diagram. Say that the proportions of fine and coarse by solid volumes are 1 to 2 and that the specific gravity of both is 2.6. Then the weight of fine aggregate is 1020 lb. and of croase aggregate, 2040 lb.

Fig. 3 shows a very convenient type of diagram which may be drawn for given specific gravities. This diagram is based on a specific gravity of 2.66 for the aggregates. If the gallons of water per sack of cement and the weight of satured-surface-dry aggregate per 94-lb. sack of cement are known, the amount of cement per cu. yd. of concrete may be determined.

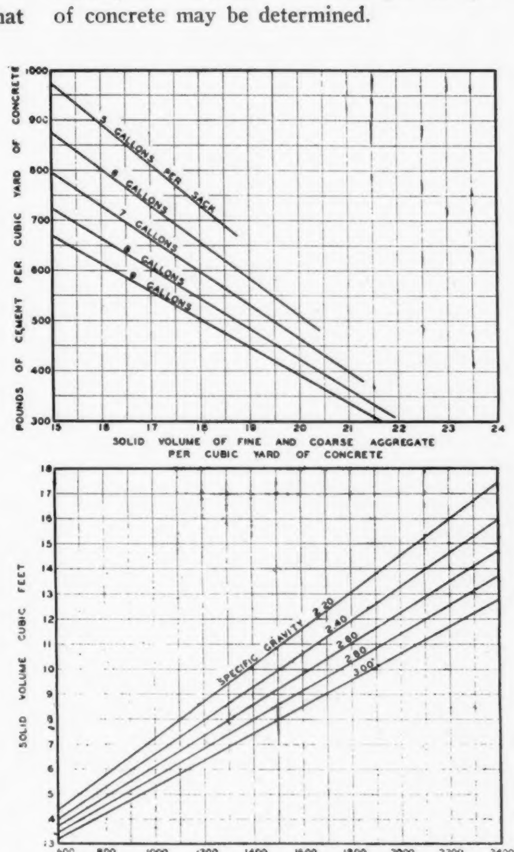


Fig. 2

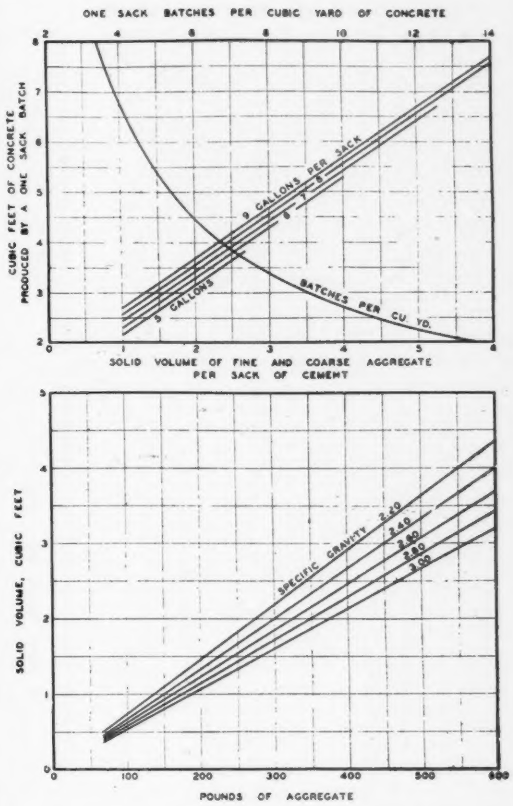


Fig. 1

Algebraic Formula

For those who prefer an algebraic formula for the solution of their problems the following simple equation has been derived which is applicable to the many types of problems which may be encountered. It is,

$$C = \frac{27}{0.485 + x + \frac{Wf}{62.5\ Sf} + \frac{Wc}{62.5\ Sc}}$$

Where,

C = number of 94-lb. sacks of cement per cubic yard of concrete.

x = cubic feet of mixing water, including moisture, used with each sack of cement, or the water-ratio.

Wf = weight of saturated-surface-dry fine aggregate used with each 94-lb. sack of cement.

Wc = weight of saturated-surface-dry coarse aggregate used with each sack of cement.

Sf and Sc = specific gravities of saturated-surface-dry fine and coarse aggregates, respectively.

Comparisons with Measured Quantities

Table 1 shows comparisons of quantities of cement calculated by the method outlined in this paper with measured quantities. The data are averages of several mixes. The detailed results are shown in Bulletin 1 on "Estimating Quantities of Materials for Concrete," of the National Sand and Gravel Association. These show the calculated quantities to be practically identical with the measured ones. It should be emphasized

that the estimated quantities of materials will never be less than those actually required if the correct weights, proportions and specific gravities are used. The method may give quantities somewhat greater than those used, depending on the amount of unfilled void space or entrained air. When the measured quantities are greater than the computed ones, either incorrect factors have been used in the calculations or an error has been made in the measurements.

Tables of Quantities

Tables showing the quantities of materials required for a cubic yard of concrete have been computed for a wide range of mixtures and are published, together with a description of a method of applying them, in Bulletin 4 of the Engineering and Research Division of the National Sand and Gravel Association. These tables are quite voluminous and it is not practical or desirable to include them in this paper. They are readily available to any who wish to secure copies of them. A request sent to the Washington office of the association will bring them.

TABLE 1. COMPARISONS OF ESTIMATED QUANTITIES WITH MEASURED QUANTITIES

Averages from detailed tabulations in Bulletin 1, "Estimating Quantities of Materials for Concrete," of the National Sand and Gravel Association.

Source of Data	Range of Mixes	Average Cement sacks per cu. yd. Measured	Computed
Lewis Institute	27 proportions of different mixes and consistencies	6.08	6.08
Bureau of Standards	4 mixes	5.16	5.24
University of Illinois	22 proportions of different mixes and consistencies	5.76	5.76

Approximate Method

For the usual aggregates the following approximate method may be found convenient when quick and rough estimates are required. The average concrete, made with ordinary aggregates, will weigh within 100 lb. of 4000 lb. per cu. yd. The use of 4000 lb. will not introduce an important error, if results accurate within about 5% are considered satisfactory.

With this factor as a basis, the volume of concrete produced by given weights of materials may be computed directly by the addition of the weights of cement, water and aggregates and dividing by 4000. For example, a 6-sack batch of a 1-2-4 by weight concrete, mixed with 7 gallons of water per sack of cement would weigh,

Cement, 6 × 94	= 564 lb.
Fine aggregate, 2 × 564	= 1128 lb.
Coarse aggregate, 4 × 564	= 2256 lb.
Water, 6 × 7 × 8.33 lb.	= 350 lb.
Total	= 4298 lb.

This weight of materials would produce about $\frac{4298}{4000}$ or 1.07 cu. yd. of concrete.

Advantages of Low Voids

Low voids accompanied by good grading are very important from the viewpoint of economy. For given proportions the aggregate with the lowest voids will in general produce the most concrete, providing approximately the same quantity of mixing water is used. The percentage of voids of an aggregate is reflected by its weight. For example, an aggregate of a given specific gravity weighing 2700 lb. per cu. yd. will have lower voids than one of the same specific gravity weighing 2500 lb. per cu. yd. and in a given mix will produce a greater volume of concrete, if other conditions are equal.

If the specific gravity of the two aggregates in the above example were 2.66, the one weighing 2700 lb. per cu. yd. would contain 16.2 cu. ft. of solid particles, while the one weighing 2500 lb. would contain only 15 cu. ft. Consequently in a mix in which all of the voids were filled and the same quantity of mixing water were used, the heavier aggregate would produce approximately 1.2 cu. ft. more concrete than the lighter one.

From this it is also clear that the same weights of these two materials would produce approximately the same volume of concrete. If 2700 lb. of the aggregate weighing 2500 lb. per cu. yd. were used, there would be 16.2 cu. ft. of solid material and consequently the same volume of concrete would be produced as for a like weight of the material weighing 2700 lb. per cu. yd., providing always that the sand were the same in each case, and approximately the same quantity of mixing water were used.

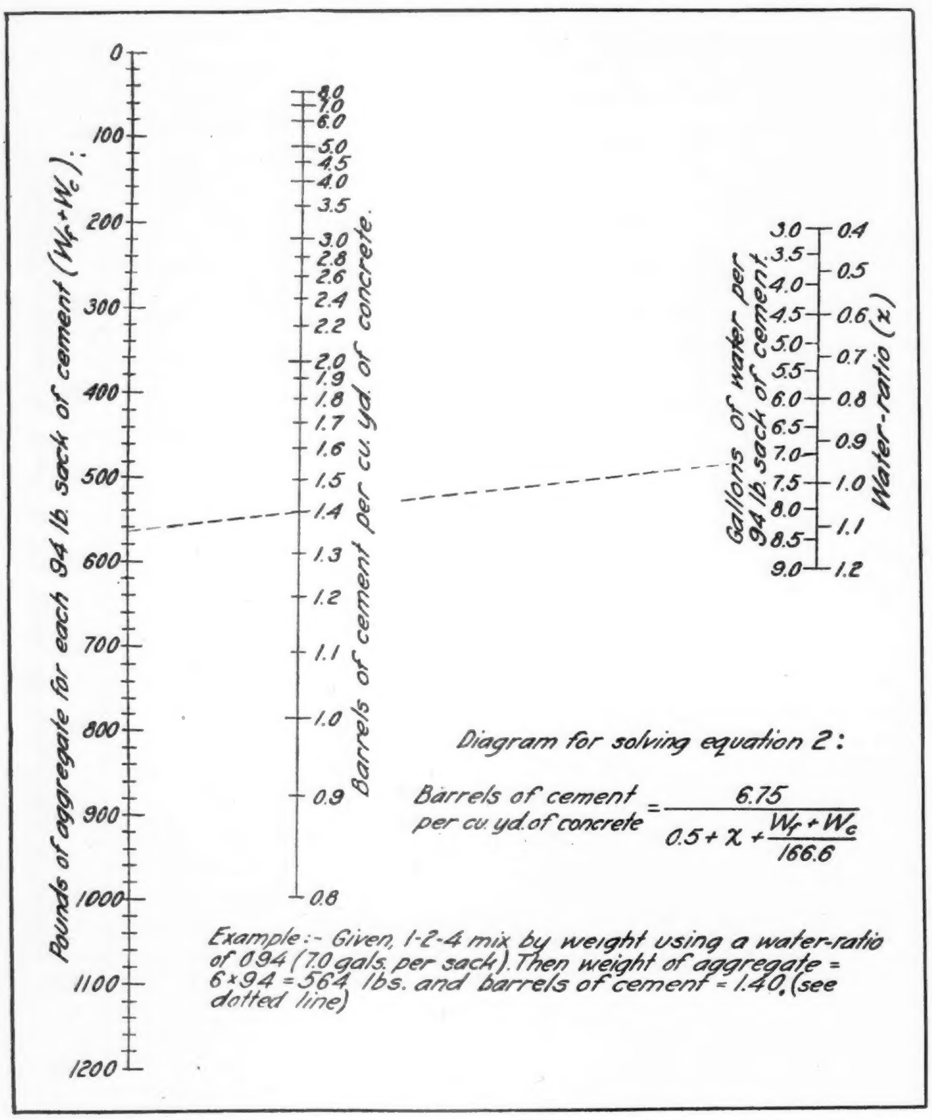


Fig. 3

Collins Makes New Affiliation

D. R. ("SPEC") COLLINS, formerly president of the Wisconsin Concrete Products Association as well as the Concrete Masonry Association, has joined the Consolidated Concrete Machinery Corp., Adrian, Mich.

Sixth Annual Meeting Northwest Concrete Products Association

THE SIXTH ANNUAL MEETING of the Northwest Concrete Products Association was held at Hotel Governor, Olympia, Wash., and again brought together representatives of the industry from the key cities of Washington, Oregon and Idaho.

The delegates were welcomed by Mayor George G. Mills, Olympia, who thanked the association for their decision to hold their meeting in the capitol city, and assured them of his whole-hearted co-operation, during their deliberations and all future opportunities of assisting resident members of the association.

Carl B. Warren

Due to the illness of Hans Munn, Jr., president of the association, Carl Warren of Spokane, first vice-president, presided. The response to Mayor Mills' remarks was made by W. P. Hews, Yakima, secretary of the association.

The three principal addresses during the convention were made by H. H. Botten, chief engineer Washington Surveying and Rating Bureau, on "The Rating Bureau, its Purpose and Operation"; W. H. Sharp director, American Concrete Pipe Association; and Bailey Tremper, engineer of tests, Washington State Highway Department, on the subject "Concrete Culvert Pipe Investigations."

Numerous committee reports and papers showed that the association continues in good shape and that plans will shortly be announced for the mid-summer convention of the association.

H. W. Nightengale, sanitary engineer, Washington State Department of Health, gave his address during the second day's session on "Sewage Disposal in Urban and Rural Districts."

The usual entertainment consisting of an informal dinner and dance at the Hotel Governor was given the delegates following the sessions of the first day, and after the business sessions of the final day, delegates stayed over as guests of the Olympia Golf and Country Club.

Lincoln, Neb., Has New Ready-Mix Plant

THE READY-MIX CONCRETE CO., recently opened, brings to Lincoln, Neb., a central mixing plant such as is found in many large cities. The plant and office is located at 18th and Y streets. It has a capacity of mixing 60 cu. yd. an hour. Warren T. Roberts is the manager.

The plant has a 2 cu. yd. mixer installed on the ground with a tower and platform erected over it for the other equipment. The water tank, scales and bins for holding the aggregate are located above. A trestle leads up from the trackage and there is a tunnel underneath where cars are unloaded. The materials are elevated from the tunnel to the bins above.

In mixing the cement the water ratio is controlled by an automatically discharged tank which measures out the water for each batch exactly as set by the operator. The mixer is equipped with a batch-meter which times the mixing of all the concrete. It automatically locks the discharge until the concrete has mixed the required time. The plant is so designed that it can be started or stopped by merely pressing a button. Its six units are each driven by a large electric motor and can be operated either separately or together. It is equipped with flood lights for night operation. Concrete can be furnished either day or night and any amount of concrete can be produced for continuous pouring as is sometimes required in certain types of construction.

The new Ready-Mix Concrete Co. is owned by the Abel Construction Co. "Years ago," said Mr. Abel, "there were but few central mixing plants operating in the United States. Today at least one may be found in practically every large city. Growing from a mere experiment, they have rapidly developed until, at the present time the mixing of concrete in central plants has now become a very important industry and a modern necessity.

"The old fashioned method of mixing concrete on the job is fast taking its place with the old fashioned spinning wheel, horse drawn vehicles, sailing vessels and many other relics in use prior to our age of new developments.

"All weighing and measuring is under the direct supervision of one operator, trained and skilled in his work. All apparatus is tested daily which absolutely eliminates any possible chance of mistake."—*Lincoln* (Neb.) *State Journal.*

Spokane Concrete Pipe Co. Rebuilds Plant

DURING THE PAST YEAR the entire plant of the Spokane Concrete Pipe Co., Spokane, Wash., has been completely rebuilt, and it now has a concrete block building approximately 100 ft. by 100 ft. in size.

The steam rooms, where the pipe are cured, are all of saw-tooth roof construction, so that light is more easily admitted and makes for better working conditions for employes. The outside curing of the pipe is furthered by the use of an elaborate sprinkling system, which completely covers the storage yards.

The general plant set-up is about the same as most machine-tamped pipe plants. A No. 1 and a No. 2 Tuerck-MacKenzie machines are used.

The company finds a splendid market in the Inland Empire on culvert, irrigation and sewer pipe work. Pipe is now furnished to Washington, Idaho and Montana.

Plant of Spokane Concrete Pipe Co., Spokane, Wash.

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.15	1.15	1.75		1.75	1.75
Buffalo, N. Y.		1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.80	1.00	1.25		1.25	
Leeds Jct., Scarboro, Me., and Milton, N. H. (b)		.50		1.75d	1.25	1.00c
Machias Junction, N. Y.	.75	.75	.75		.75	.75
Montoursville, Penn.	1.00	.75	.60	.40	.40	.40
Georgetown, D. C.	.55	.55	1.00	1.00	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.30	.20	.20	.35	.35	.40
Attica, Ind.	All sizes .75–.85 per ton					
Barton, Wis. (e)		.35	.55	.60	.60	.60
Cincinnati, Ohio	.55	.55	.80	.80	.80	.80
Columbus, Ohio	.75–1.00	.50– .75	.60– .75	.60– .75	.60– .75	.60– .75
Des Moines, Iowa	.40– .70	.40– .70	1.50–1.85	1.50–1.85	1.50–1.85	1.50–1.85
Dresden, Ohio		.60	.70– .80	.75	.75	.70
Eau Claire, Wis.	.50	.50	.65	1.00	1.00	
Elkhart Lake and Glenbeulah, Wis.	.45	.50	.50	.60	.50	.50
Grand Rapids, Mich.		.50	.70	.70	.70	.70
Greenville, Ohio	.50– .70	.40– .60	.50– .60	.50– .60	.50– .60	.50– .60
Hamilton, Ohio	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75
Hersey, Mich.		.40		.70	.70	.70
Humboldt, Iowa		.45			1.25	
Kalamazoo, Mich.		.45	.50	.60	.75	
Kansas City, Mo.		.70– .75		1.50		
Mankato, Minn.	.55	.45	1.25	1.25	1.25	1.25
Mason City, Iowa	.50	.50	.85	1.25	1.25	1.25
Milwaukee, Wis.		.86	.86	.96	.96	.96
Minneapolis, Minn.	.25– .35	.25– .35	1.25–1.35	1.25–1.35	1.25–1.35	1.25–1.35
Oxford, Mich.	.25– .35	.20– .30	.30– .40	.55– .75	.55– .75	.60– .75
St. Louis, Mo.	.45– .75	.45– .85	.50– .90	.50– .90	.50– .75	.50–1.00
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.00	1.00	1.00
SOUTHERN:						
Brewster, Fla.	.40					
Charleston, W. Va.	.70	1.25	1.25			
Eustis, Fla.		.40– .50				
Fort Worth, Tex.	1.00	1.00	1.25	1.25	1.25	1.25
Knoxville, Tenn.	.60–1.00	.80–1.00			1.20	1.20
Roseland, La.	.50	.50	1.10	.85	.85	
WESTERN:						
Phoenix, Ariz.	1.25*	1.15*	1.50*	1.15*	1.00*	1.00*
Pueblo, Colo.	.80	.60		1.20	1.20	1.15
San Gabriel, San Fernando Valleys, Cal. (a)	.80	.70	1.20	1.20	1.20	1.20
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

*Cu. yd. ‡Delivered on job by truck. (a) Discount, 20c per ton if paid by 10th of month following delivery. (b) In carload lots. (c) Gravel, 2½-in. down to ¼-in. (d) ⅝-in. down to ¼-in. (e) Plus 10c per ton for winter loading.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.60	2.50	2.60			4.00	
Cheshire, Mass.						5.00	
Columbus, Ohio	1.35–1.50	1.25–1.50	2.00	1.25–1.35		3.50–4.50	
Dresden, Ohio	1.15–1.50	1.00–1.35	1.25–1.50	1.00–1.25	1.25		
Eau Claire, Wis.						2.00–3.00	
Elco, Ill.	Amorphous silica, 90-99½% thru 325 mesh, 10.00–60.00 per ton						
Kasota, Minn.							1.00
Mendota, Va.	Flint, 8.00–10.00 per ton						
Montoursville, Penn.				1.35–1.60			
New Lexington, Ohio	2.00	1.75					
Ohlton, Ohio	1.75	1.75		1.75	1.75	1.75	
Ottawa, Ill.						3.50	
Red Wing, Minn. (a)					1.50	3.00	1.50
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50–3.50†	5.00†	3.50–5.00†	
South Vineland, N. J.	Washed silica 1.50 per ton; washed and dried silica, 2.00 per ton						

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Dresden, Ohio		1.00
Eau Claire, Wis.	4.30	
Ohlton, Ohio	1.75	1.75
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

Glass Sand

(Silica sand is quoted washed, dried and screened)

Cheshire, Mass. (in carload lots)	5.00
Klondike, Mo.	2.00
Mendota, Va.	2.50–3.00
Ohlton, Ohio	2.40
Ottawa, Ill.	1.50
Red Wing, Minn.	1.50
South Vineland, N. J.	1.75
San Francisco, Calif.	4.00–5.00

Bank Run Sand and Gravel

Algonquin, Ill.¶ (½-in. and less)	.30
Buffalo, N. Y.—Sand, 1/10-in. down, 1.00; ¼-in. down, .85; gravel, all sizes	.75
Burnside, Conn. (sand, ¼-in. and less)	.75*
Fort Worth, Tex.¶ (1½-in. and less, .65; 2-in. and less	.65
Gainesville, Tex.¶ (1-in.–1½-in.and less)	.55
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hersey, Mich.¶ (1-in. and less)	.50
Kalamazoo, Mich.¶ (1½-in. and less)	.35
Mankato, Minn.†	.70
Winona, Minn.—Sand, any size	.50– .60
York, Penn.—Sand, 1/10-in. down, 1.10; ¼-in. and less	1.00

*Cu. yd. †Fine sand. 1/10-in. down. ¶Gravel.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

F.o.b. city named	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.82½	3.30	
Atlanta, Ga.		†2.15–2.19*	3.45¶
Baltimore, Md.		†2.23–2.26*	3.53¶
Birmingham, Ala.		†1.81–1.85*	3.11¶
Boston, Mass.	.46	†1.84–1.88*	3.23¶
Buffalo, N. Y. (d)	.45½	†1.92–1.95*	3.12–3.22¶
Cedar Rapids, Ia.		2.23*	
Charleston, S. C.		1.89†	3.26¶
Cheyenne, Wyo.	.60½	2.42	
Chicago, Ill.		†1.92–1.95*	3.22¶
Cincinnati, Ohio		2.14*	3.44¶
Cleveland, Ohio		†1.87–2.04*	3.17¶
Columbus, Ohio		†2.14–2.17*	3.44¶
Dallas, Tex.		1.79–1.90*	3.49¶
Davenport, Iowa		2.14*	
Dayton, Ohio		2.14*	3.44¶
Denver, Colo.	.66¼	2.65	
Des Moines, Iowa	.48½	2.29*	
Detroit, Mich.		1.95*	3.25¶
Duluth, Minn.		2.04*	
Houston, Tex.		1.89–2.00*	3.73¶
Indianapolis, Ind.	.54¾	1.99*	3.29¶
Jackson, Miss.		†2.24–2.29*	3.54¶
Jacksonville, Fla.		2.12†	3.43¶
Jersey City, N. J.		†2.10–2.13*	3.40¶
Kansas City, Mo.	.50½	2.02*	3.32¶
Los Angeles, Calif.	.57½	2.30	
Louisville, Ky.	.55½	†2.07–2.12*	3.37¶
Memphis, Tenn.		†2.03–2.29*	3.33¶
Milwaukee, Wis.		2.10*	3.40¶
Minneapolis, Minn.		2.27*	
Montreal, Que.		1.60‖	
New Orleans, La.		1.92†	3.22¶
New York, N. Y.	.49¾	†1.99–2.03*	3.29¶
Norfolk, Va.		1.97*	3.27¶
Oklahoma City, Okla.	.60¾	†2.43–2.46*	3.73¶
Omaha, Neb.	.55½	†2.22–2.36*	3.52¶
Peoria, Ill.		2.12*	
Pittsburgh, Penn.		†1.92–1.95*	3.22¶
Philadelphia, Penn.		†2.12–2.15*	3.42¶
Portland, Ore.		‡2.40–2.50	
Reno, Nev.		2.96‡	
Richmond, Va.		†2.29–2.32*	3.59¶
San Francisco, Calif.		2.24‡	
Savannah, Ga.		1.89†	3.19¶
St. Louis, Mo.	.48¾	†1.60–1.95*	2.90¶
St. Paul, Minn.		2.27*	
Seattle, Wash.		1.50–1.75	2.50c
Tampa, Fla.		2.00†	3.41¶
Toledo, Ohio		*2.10–2.20†	3.50¶
Topeka, Kan.	.55¼	2.21*	3.51¶
Tulsa, Okla.	.57½	†2.30–2.33*	3.60¶
Wheeling, W. Va.		†1.99–2.02*	3.29¶
Winston-Salem, N.C.		2.44*	3.74¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

Bellingham, Wash.		2.25	
Bonner Springs, Kan.		1.85	3.15¶
Buffington, Ind.		1.70	
Concrete, Wash.		2.65	
Dallas, Tex.		1.74	
Hannibal, Mo.		1.80	
Houston, Tex.		1.84	
Hudson, N. Y.		2.36†	3.26¶
Independence, Kan.		1.85	
Leeds, Ala.		1.70	
Limedale, Ind.		1.70	
Lime & Oswego, Ore.		2.50	
Nazareth, Penn.		2.15	
Northampton, Penn.		1.75	
Richard City, Tenn.		2.05	
Steelton, Minn.		1.85	
Toledo, Ohio		2.20	
Universal, Penn.		1.70	
Waco, Tex.		1.85	

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% cash discount. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. ‖Includes sales tax. (c) Quick-hardening "Velo," packed in paper bags. (d) Also †1.82 per barrel.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Ft. Spring, W. Va.	.35	1.35	1.25	1.25	1.15	1.00
Frederick, Md.	.50–1.00	1.50	1.15–1.50	1.15–1.50	1.05–1.25	1.05–1.25
Oriskany Falls and Munnsville, N. Y.	.50–1.00	....	....	1.00–1.35	....	....
Prospect Junction, N. Y.	1.00	1.25	1.30	1.25	1.25	1.15
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Hillsville, Penn.	.85	1.35	1.35	1.35	1.35	1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	....	1.75	....	....	....
Afton, Mich.	.25	.25	.25	....	.65	1.50
Cypress, Ill.	....	1.00	1.00	.90	.90	.90
Dubuque, Iowa	1.10	1.10	1.10	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	....
Greencastle, Ind.	1.25	1.00	1.00	.90	.90	.90
Lannon, Wis.	.80	.80	.80	.80	.80	.80
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	....
Stone City, Iowa	.75	....	1.10	1.00	1.00	1.00f
Toledo, Ohio (a)	1.10	1.60	1.60	1.60	1.60	1.60
Toronto, Canada (j)	2.10	2.10	2.00	2.00	2.00	2.00
Waukesha, Wis.	.90	.90	1.00	1.00	1.00	....
SOUTHERN:						
Cartersville, Ga.	.75	1.15	1.15	1.00	.90	.90
Chico, Tex.	.50	1.30	1.30	1.25	1.20	....
El Paso, Tex. (k)	.50	1.25	1.25	1.00	1.00	1.00
Olive Hill, Ky.	.50–1.00	1.00	1.00	.90	.90	.90
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (h)	.25	.25	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.10	1.25	1.25	1.25	1.00	....
Rock Hill, St. Louis Co., Mo.	1.30–1.40	1.30–1.40	1.10–1.40	1.30–1.40	1.30–1.40	1.30–1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn.	1.20	1.60	1.45	1.35	....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	....
Bridgeport, Chico and Knippa, Texas	2.25–2.50	1.80–2.00	1.50–1.60	1.30–1.40	1.20–1.30	1.00–1.25
Duluth, Minn.	1.00	2.25	1.75	1.65	1.35	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Farmington, Conn.	1.00	1.30	1.30	1.00	....	....
Knippa, Texas	2.50	2.50	2.50	1.20	....	....
New Britain, Plainville, Rocky Hill, Middlefield, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	....
Northern New Jersey	1.55	2.30	2.10	1.70	1.70	....
Richmond, Calif.	.75	1.00	1.00	1.00	1.00	....
Toronto, Canada (j)	4.70	5.80	4.05	....	....	....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.50	....	1.60	1.60	1.40	....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40l
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.—Granite	.50	1.25	1.25	1.10	1.00	....
Lohrville, Wis.—Granite	1.80	1.60	....	1.50	1.50	....
Middlebrook, Mo.—Granite	3.00–3.50	....	2.00–2.25	2.00–2.25	....	1.25–3.00
San Gabriel and San Fernando Valleys, Calif. (Granite)	....	1.30	1.30	1.30	....	1.30
(Basalt)	....	....	....	.85	....	....
Toccoa, Ga.—Granite	.50	....	1.25	1.30	1.20	1.20

(a) Screenings, including dust. (c) 1-in., 1.40. (d) 2-in., 1.30. (f) Rip rap. (g) Cu. yd. (h) Rip rap, 1.20–1.40 per ton. (j) Extra charge of 10c per ton for winter delivery; all prices less 5% for payment 15th following month. (k) Roofing gravel, per ton, 1.25. (l) Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem, Penn.	1.25–1.50	.50– .60	1.00	.60– .70	.70– .80	.70– .90	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Hokendauqua, Penn.	1.50	.60	1.00	.80–1.00	1.00–1.25	1.00–1.25	1.00–1.25
Western Pennsylvania	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	....	1.05*	1.80*	1.45*	1.45*	1.45*	1.45*
Jackson, Ohio	....	.65*	1.55*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.10	1.00‡	1.10	1.10	1.10	1.10	1.10
SOUTHERN:							
Ashland, Ky.	....	1.05*	1.65*	1.45*	1.45*	1.45*	1.45*
Ensley & Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Va.	2.50	1.25	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05*	.55*	....	1.15*	.90*	.90*	....

5c per ton discount on terms. †1½-in. to ¼-in., 1.05; ⅝-in. to 10 mesh, 1.25*; ⅝-in. to 0-in., 90c*; ¼-in. to 10 mesh, .80*. ‡Including dust.

Agricultural Limestone

(Pulverized)

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 50% thru 50 mesh 1.50
Cartersville, Ga. 2.00
Cypress, Ill. 1.25
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton 6.00
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; bulk, 3.00; in bags 4.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; in bags 5.00
Jamesville, N. Y.—Bulk, 3.80; in 80-lb. bags 5.05
Joliet, Ill. 3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, in 100-lb. paper bags, 3.75; bulk 2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh 4.25
West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 50 mesh; bags, per ton, 3.75; bulk 2.50

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$; 0.3% $MgCO_3$, 90% thru 100 mesh 4.00
Bedford, Ind.—Analysis, 98.44% $CaCO_3$; 0.83% $MgCO_3$; 90% thru 10 mesh 1.50
Cartersville, Ga.—90% thru 50 mesh, per ton 1.25
Chico, Tex.—Limestone flour, or mill floats, per 100-lb. bag, f.o.b. plant 1.00
Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder 3.50
Cypress, Ill.—90% thru 100 mesh, 1.10; 50% thru 100 mesh, 1.10; 90% thru 50 mesh, 1.00; 50% thru 50 mesh, .90; 90% thru 4 mesh, .90, and 50% thru 4 mesh .... .90
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton 1.10
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton 1.70
Dubuque, Ia.—Analysis, 64.20% $CaCO_3$; 32.64% $MgCO_3$; 50% thru 50 mesh 1.10
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 90% thru 50 mesh; bulk, per ton 1.15
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh 1.25
Lannon, Wis. — Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼-in. to dust) 1.00
Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00
Marlbrook, Va.—Precipitated lime-marl. Analysis, 96% $CaCO_3$; 1% $MgCO_3$, 90% thru 50 mesh, bulk, 2.25; in burlap bags 3.75
Olive Hill, Ky.—90% thru 4 mesh, two grades, per ton .... .50 & 1.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, and 45% thru 200 mesh, per ton a5.00
Piqua, Ohio—30%, 50% and 99% thru 100 mesh 1.00–4.00
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh .... .75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 50 mesh, bulk 3.50
100-lb. paper bags, 4.75; 100-lb., cloth 5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00: 50% thru 100 mesh 2.10
*Less 25c cash 15 days. (a) Less 50c comm.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton 6.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra) 3.50
Piqua, Ohio—99% thru 100 mesh, bulk, 3.25; in 80-lb. or 100-lb. bags 4.25
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk 4.00

Lime Products

(Carload prices per ton f.o.b. shipping point unless otherwise noted)

EASTERN:	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
Berkeley, R. I.	....	....	10.50	....	....	17.50	....	19.25
Buffalo, N. Y.	....	....	....	11.00	....	....	....	....
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	....	9.50a	9.50a	9.50a	8.00f	9.50d	8.50	....
Frederick, Md.	....	8.50	8.50	8.50	....	8.50	6.50	13.50
Lime Ridge, Penn.	....	....	8.00	....	6.50	7.50[1]	4.50	....
West Stockbridge, Mass.	....	8.25– 8.75	8.25– 8.75	....	....	13.50h	10.00	15.35
CENTRAL:								
Afton, Mich.	....	....	....	....	....	10.85	6.50	....
Cold Springs, Ohio	....	6.00	6.00	....	....	....	6.00	....
Clay Center, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	7.75	6.00	6.00	11.00	6.00	8.00	6.00	....
Delaware, Ohio	7.75	6.00	6.00	7.00	6.00	....	6.00	....
Milltown, Ind.	....	9.00	8.25	9.50	7.50	....	7.00	....
Sheboygan, Wis.	....	10.50	10.50	....	....	....	9.50	20.00e
White Rock, Ohio	7.75	....	6.00	....	6.00	8.00	6.00	....
Woodville, Ohio	7.75	6.00	6.00	9.00	6.00	8.00	6.00	15.00c
SOUTHERN:								
Keystone, Ala.	15.00	8.00	....	7.50– 8.00	....	....	5.50j	13.75k
Ocala, Fla.	17.25	10.00	10.00	11.00	....	....	10.50	1.50
Knoxville, Tenn.	....	8.00	8.00	7.50	....	....	6.00	12.50
Pine Hill, Ky.	....	9.00	8.00	7.50– 9.00	....	....	6.00	12.50
WESTERN:								
Little Rock, Ark.	....	14.30	....	14.30	....	....	....	17.40
Kirtland, N. M.	....	....	....	....	....	....	15.00	....
Los Angeles, Calif.	15.50	14.50	....	....	....	....	16.00	....
San Francisco, Calif.†	20.00	20.00	12.00	20.00	....	....	....	....
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50[6]	....	11.00[4]	....

[1]In 100-lb. bags. [4]To 14.50. [6]Also 13.00. *Price to dealers. †Wood-burnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (a) In 50-lb. paper. (c) In steel; in wood, 14.00. (d) In 80-lb. paper bags. (e) In steel. (f) For chemical purposes. (h) To 17.50. (j) To 6.50. (k) To 14.85.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 300-mesh, 6.00 per ton in paper bags

Slate Granules

Esmont, Va.—Blue, 7.50 per ton.

Granville, N. Y.—Red, green and black, 7.50 per ton.

Pen Argyl, Penn.—Blue-black, 6.00 per ton in bulk.

Roofing Slate

City or shipping point	Prices per square—Standard thickness 3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00–14.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00–10.25	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75– 7.25	....	....	....	....	....
Granville, N. Y.—						
Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green & gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple & unfading gr'n	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Pen Argyl, Penn.						
Graduated slate	....	16.00	23.00	27.00	37.00	46.00
No. 1 clear (smooth text)	7.25–10.50; Albion-Bangor medium, 8.00–9.00; No. 1 ribbon, 8.00–8.50					

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00
Ground talc (20-50 mesh), bags	6.50
Ground talc (150-200 mesh), bags	9.00
Pencils and steel crayons, gross	1.50– 2.00
Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh	7.00– 7.50
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.	
Clifton, Va.:	
Ground talc (150-200 mesh), in bags	10.00
Emeryville, N. Y.:	
Ground talc (200 mesh), bags	13.75
Ground talc (150-200 mesh), in bags	5.50– 8.25
Hailesboro, N. Y.:	
Ground talc (300-350 mesh), in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run), bulk	3.50– 4.00
Ground talc (150-200 mesh), in bags	5.50– 8.25
Joliet, Ill.:	
Ground talc (200 mesh), in bags:	
California talc	30.00
Southern talc	20.00
Illinois talc	10.00
Los Angeles, Calif.:	
Ground talc (150-200 mesh), in bags	15.00–25.00
Natural Bridge, N. Y.:	
Ground talc (325 mesh), bags	10.00–15.00

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.	4.25– 4.75
Mt. Pleasant, Tenn.—B.P.L. 72-77%	5.00– 6.75

Ground Rock
(2000 lb.)

Gordonsburg, Tenn.	5.25– 6.00
Mt. Pleasant, Tenn.—(Lime phosphate)—B.P.L. 73%; per ton, bags extra	11.80
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00– 5.25

Florida Phosphate

(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines	
68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Rumney Depot, Bristol and Cardigan, N. H.—Per ton:	
Punch mica, per ton	150.00–240.00
Mine scrap	22.50
Mine run	325.00
Clean shop, scrap	25.00
Roofing mica	37.50
Trimmed mica, per ton, 20 mesh, 37.50; 40 mesh, 40.00; 60 mesh, 40.00; 100 mesh, 45.00; 200 mesh	60.00
Spruce Pine, N. C.—Mine scrap, per ton	18.00– 20.00

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—Special	Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long, 17c per ft., 23.00 per ton.												
Grand Rapids, Mich.	....	....	....	9.00	9.00	9.00	....	....	....	....	15.00	15.00	27.00
Los Angeles, Calif. (a)	....	7.50	7.50	12.20	12.20	....	13.20	....	29.00	....	....	....	....
Medicine Lodge, Kan.	1.40	....	....	....	....	....	11.50b	....	16.00b	11.50b	....	....	....
Oakfield, N. Y.	2.50	....	....	6.00	9.00b	9.00b	....	6.00b	....	....	....	....	....
San Francisco, Calif.	....	....	....	....	14.90b	....	....	....	....	....	....	....	....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	——	——	——	....	20.00	25.00e	33.00d

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) ⅜-in. plaster lath, 16c per sq. yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜-in.x48-in. by 5 and 10 ft. long. (e) ⅜x48-in. by 3 to 4 ft. long.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N.Y.—Bio-Spar, per ton in bags, in carload lots, 9.00; less than carload lots, per ton in bags	....	12.00
Crown Point, N. Y.—Mica Spar	....	¶9.00–‖12.00
Davenport, Ia. — White limestone, in bags, ton	‖6.00	‖6.00
Los Angeles, Calif.—		
White	¶12.00–‖14.50	¶12.00–‖14.50
Snowflake		¶12.00–‖14.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—		
White	¶9.80– ‖9.80	¶9.80– ‖9.80
Snowflake		¶9.80– ‖9.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red	....	20.00– 25.00
Middlebury, Vt.—White	....	¶9.00–‖10.00
Middlebury & Brandon, Vt. — Caststone, per ton, including bags	....	c5.50
Phillipsburg, N. J.—Royal green granite, in bags	15.00– 18.00	....
Randville, Mich.—Crystalite, crushed white marble, bulk	4.00	4.00– 7.00
Tuckahoe, N. Y.	7.00	
Warren, N. H. (d)		¶8.00– 8.50

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L. (d) L.C.L., 9.50–15.00 per ton in 100-lb. bags.

Art and Cast Stone Aggregates

Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00	‖12.50
Dolomite special cast stone, wet cast aggregate, white, ¼-in. to dust	a4.70	......

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Chicken Grits

Cypress, Ill.—(Agstone), per 100-lb. sack	.90
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per 100-lb. sack, f.o.b. Chico	1.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
El Paso, Tex.—(Limestone), per 100-lb. sack	.75
Gibsonburg, Ohio—(Agstone)	10.00
Joliet, Ill.—(Agstone)	10.00
Los Angeles, Calif.—(Gypsum), per ton, including sacks	7.50– 9.50
Marble grits, per ton, incl. sacks	10.00–12.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, Ohio—(Pearl grit), No. 1 and No. 2	1.00– 4.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Randville, Mich.—(Marble), per ton, bulk	6.90
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–‖9.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Cement Drain Tile

Grand Rapids, Mich.—Drain tile, per 1000 ft.

4-in.	40.00	15-in.	325.00
5-in.	50.00	18-in.	450.00
6-in.	75.00	20-in.	600.00
8-in.	110.00	22-in.	750.00
10-in.	165.00	24-in.	850.00
12-in.	190.00		

Granular Glasspar

(Chemically Controlled)

Spruce Pine, N. C.—Color, white; analysis, K_2O, 7.20%; Na_2O, 3.70%; SiO_2, 70%; Fe_2O_3, 0.05%; Al_2O_3, 17.50%; per ton, in bulk	10.50

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh	18.00
Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	18.00

Potash Feldspar

East Liverpool, Ohio — Color, white; analysis, K_2O, 11.00%; Na_2O, 2.25%; SiO_2, 68.00%; Fe_2O_3, .08%; Al_2O_3, 17.95%, pulverized, 99% thru 200 mesh, in bags, 22.00; in bulk	20.00
Erwin, Tenn.—White; analysis, K_2O, 10.50%; Na_2O, 2.75%; SiO_2, 67.75%; Fe_2O_3, .08%; Al_2O_3, 18.00%, pulverized, 98% thru 200 mesh, in bags, 16.00; bulk	15.00
Crude, in bags, 7.50; bulk	6.50
Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	18.00
Trenton, N. J.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 69%; Fe_2O_3, 0.08%; Al_2O_3, 17%; pulverized, 98% thru 200 mesh; bulk, 20.00; in bags	21.20
West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk	19.00
Rochester, N. Y.—Color, white; analysis, K_2O, 12.50%; Na_2O, 2.60%; SiO_2, 64.20%; Fe_2O_3, 0.06%; Al_2O_3, 19.10% pulverized 98% thru 200 mesh; in bags, 23.50; bulk	22.00

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	
Beloit, Wis.:	
8x8x16	16.00*
Brookville, Penn.: 8x8x16	20.00–23.00*
Camden, N. J.: 8x8x16, each	.18b
Chicago, Ill.:	
8x8x16. Each	.17§
8x8x16. Each	.20a
Columbus, Ohio: 8x8x16	14.00§–16.00‡
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12‡
Lexington, Ky.:	
8x8x16	‡18.00*
8x8x16	†16.00*
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*
Omaha, Neb.: (c)	
8x 4x16, each .06½§; 8x6x16, each	.09§
8x 8x16, each, .10§; 8x12x16, each	.15§
Oak Park, Ill.:	
8x8x16, per 1000	160.00
Passaic, N. J.: 8x8x16 in. Each	.16
12x8x16 in. Each	.24
Pittsburgh, Penn. (Prices at yard)	
8x 8x16. Each	.17§
8x 8x16. Each	.19a
8x12x16. Each	.20§
8x12x16. Each	.22a
Wichita, Kan.:	
8x8x16. Each	.11§

*Price per 100 at plant.
†Rock or panel face.
‡Face. §Plain. (a) Rock face. (b) Less 5%.
(c) Faced block, priced 2c higher than plain block prices quoted.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French tile, 9x15 in., per sq.	9.50–11.50
Spanish tile, 9x15 in., per sq.	10.00–12.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Lexington, Ky.—8x15, per sq.: Red	15.00
Green	18.00
Longview, Wash.: 4x6x12-in., per 1000	55.00
4x8x12-in., per 1000	65.00
New Castle, Penn.—Red, 9x15-in.	12.00
Green, 9x15-in.	15.00
New York City, N. Y.:	
Roofing tile, red, 10.00; green	12.00

Cement Building Tile

Oak Park, Ill. (Haydite):		
8x 8x16, per 100	20.00	
Lexington, Ky.:		
5x8x12, per 1000	55.00	
4x5x12, per 1000	35.00	
Longview, Wash. (Stone Tile):		
4x6x12, per 1000, at plant	54.00	
4x8x12, per 1000, at plant	64.00	
Wichita, Kan.: (Duntile)	Plain	Glazed
8x8x12. Each	.10½	.14
6x8x12. Each	.09½	.13
4x5x12. Each	.05	.08
4x4x12. Each	.04½	.07½

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Beloit, Wis.	20.00	....
Camden & Trenton, N. J.	17.00	....
Oak Park, Ill., "Haydite"	16.00	....
Ensley, Ala., "Slagtex"	*10.00–13.00†	....
Longview, Wash.	16.50	22.00– 40.00
Milwaukee, Wis.	14.00	20.00– 42.50
Omaha, Neb.	15.00	
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	16.00–18.00	30.00– 35.00

*Price f.o.b. plant. †Delivered on job in city.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, including cost of bags	24.00

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	......	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	......	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans La.	35.00	45.00	60.00
Norfolk Va.	35.00	50.00	65.00
Passaic, N. J.	40.00	52.50	70.00
Patchogue, N. Y.	......	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids, Mich. (b)																	
Sewer	......	.12	.18–.20	.27½	.35	.57½	1.00	1.11	1.48	1.66	......	......	......	......	......	......	......
Culvert	......	......	......	.57	.67	.93	1.20	......	1.48	1.80	2.10	2.25	3.35	4.00	5.10	5.85	7.42
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15		......	1.60	......	2.50					
Mercedes, Texas																	
Tongue and groove	......	.20	.23	.29	.35	......	.74	.91	......	1.38	......	2.28	......	......	......	......	......
Sewer	.16	.22	.32	.41	.53	.78	1.05		......	1.98	......	......	......	......	......	......	......
Milwaukee, Wis.	Cast stone window sills, 5 in. x 5½ in., 50c per lineal ft.																
Newark, N. J. (d)	......	......	......	......	.90	1.15	1.50	......	......	1.85	2.35	2.76	3.77	4.93	6.21	7.66	9.28
Unreinforced	......	.16	.25	.37	......	......	......	......	......	......	......	......	......	......	......	......	......
Norfolk, Neb.	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Tiskilwa, Ill. (e)	......	......	......	.75	.85	.95	1.20	1.60	......	2.00	......	2.75	3.40	......	6.50	......	10.00
Wahoo, Neb. (c)	......	......	......	......	.85½	......	1.14	......	......	1.81	......	2.47	3.42	4.13	5.63	6.49	7.31

†21-in. diam. (a) 24-in. lengths. (b) Sewer, 21-in., 1.29; culvert, 21-in., 1.45. (c) Reinforced, 15.40 per ton, f.o.b. plant. (d) Reinforced, 21-in., 1.69; unreinforced, 21-in., 1.26; 5% cash discount. (e) Reinforced.

Important Court Decision on Valve Bags

THE FOLLOWING DECISION was rendered January 20, 1931, at Wilmington, Del., in the District Court of the United States in the case of the United States of America, plaintiff, vs. the Bates Valve Bag Corp., and affiliated companies, defendants:

"The United States of America, having filed its petition herein on the fourth day of January, 1929, and having thereafter filed its amended petition on the twenty-third day of January, 1929, and having thereafter filed its supplemental petition on the nineteenth day of November, 1929, and the defendant Bates Valve Bag Corp. (Delaware) having duly appeared herein by Clarence A. Southerland, and Ward & Gray, its solicitors, and the defendants St. Regis Paper Co. and the Bates Valve Bag Corp. (New Jersey) having duly appeared herein by Clarence A. Southerland, their solicitor, and having duly filed answers herein,

"Comes now the United States of America, by its solicitors, Leonard E. Wales, United States Attorney for the District of Delaware, John Lord O'Brian, the assistant to the Attorney General, and George P. Alt and James Maxwell Fassett, special assistants to the Attorney General, and the defendants by their solicitors hereinbefore named, and it appearing to the Court by admission of the defendants that the petition herein states a cause of action, that the plaintiff has moved the Court for an injunction and for other relief against the defendants as herein decreed, and the Court having duly considered the statements of solicitors for the respective parties and all of the defendants by their respective solicitors having consented to the entry of this decree without contest, and before any testimony had been taken, now, therefore, and upon motion of the plaintiff,

"It is ORDERED, ADJUDGED and DECREED:

"Section 1. That the Court has jurisdiction of the subject matter and of all parties hereto; that the petition herein states a cause of action against the defendants Bates Valve Bag Corp., a Delaware corporation, the St. Regis Paper Co., a New York corporation, and Bates Valve Bag Corp., a New Jersey corporation, under the Act of July 2, 1890, entitled "An Act to protect trade and commerce against unlawful restraints and monopolies," which Act is commonly referred to as the Sherman Antitrust Act; and that the petition states a cause of action against the defendants above-named under the Act of October 15, 1914, entitled 'An Act to supplement existing laws against unlawful restraints and monopolies and for other purposes,' which Act is commonly referred to as the Clayton Act.

"Section 2. That the defendant Bates Valve Bag Corp., a New Jersey corporation, has heretofore made and/or assumed contracts with licensees, lessees and/or users of valve filling machines which, by their terms, require the said licensees, lessees and/or users of the machines not to manufacture valve bags, or to buy valve bags from any corporation or person other than defendant Bates Valve Bag Corp., a New Jersey corporation, and/or such corporations or persons specifically designated by it by license or otherwise; and that certain of said contracts provide that if any of said restrictions or limitations in said contracts contained shall not be observed by the said licensees, lessees and/or users of the said machines, said contracts shall be immediately terminated and the defendant Bates Valve Bag Corp., a New Jersey corporation, may, and shall have the right to recover possession of all such machines without process of law, from said licensees, lessees and/or users of the said machines who have failed to observe said restrictions and/or limitations.

"Section 3. That each and every of the aforesaid contracts are hereby declared null and void in so far as they, or any of them, require the licensee, lessee and/or the user of the valve bag filling machine not to buy valve bags from any corporation or person other than defendant Bates Valve Bag Corp., a New Jersey corporation, and/or such corporations, or persons specifically designated by it by license or otherwise; and each and every of said contracts and all existing contracts of like effect are hereby declared null and void in so far as they, or any of them, provide that if any of the said restrictions or limitations in said contracts contained shall not be observed by the licensees, lessees and/or users of the said machines, the contract may be terminated by the defendant Bates Valve Bag Corp., a New Jersey corporation, and the said defendant may, and shall have the right to, recover possession of all such machines without process of law from said licensees, lessees and/or users of said machines.

"Section 4. That the defendants Bates Valve Bag Corp., a Delaware corporation, St. Regis Paper Co., a New York corporation, and Bates Valve Bag Corp., a New Jersey corporation, and each of them, their officers, agents, employes and representatives of every kind be and they hereby are perpetually enjoined and restrained from enforcing, or attempting to enforce, directly or indirectly, by means of the present corporate organization of the defendants, by subsidiary or controlled corporations now in existence or hereafter to be organized, or otherwise, any terms or conditions of any contract or agreement herein declared to be null and void, or any substantially similar restrictions or limitations in any other contract or agreement now in existence or hereafter to be entered into.

"Section 5. That defendants and each of them, their officers, agents, employes and representatives of every kind and all subsidiary and/or controlled corporations now in existence and/or to be hereafter organized, be and they hereby are perpetually enjoined and restrained from making, or attempting to make, any license, lease, contract of sale, or any agreement of any kind whatsoever, concerning or relating to valve bag filling machines which license, lease, contract of sale or agreement shall contain, or shall be made upon, the condition agreement or understanding that the licensee, lessee, purchaser and/or other party to any such agreement shall not sell valve bags to, or buy valve bags from, or use any valve bags manufactured by or bought from any corporation or person other than the defendants, or any of them, or any person or corporation designated by them.

"Section 6. That jurisdiction of this cause is retained for the purpose of enforcing or modifying this decree.

"Section 7. That petitioner shall recover from defendants its taxable costs herein.

(sgd.) JOHN P. NIELDS,
Judge.

"Dated Wilmington, Delaware,
January 20, 1931.

"We hereby consent to the entry of the foregoing decree, January 20, 1931.

(sgd.) WARD & GRAY,
Solicitors for defendants.
(sgd.) CLARENCE A. SOUTHERLAND,
Solicitor for defendants."

Control of Monighan Manufacturing Co. Goes to Bucyrus-Erie Company

CONTROL of the Monighan Manufacturing Co., Chicago, Ill., has passed to the Bucyrus-Erie Co., South Milwaukee, Wis., through the purchase of more than 51% of the 80,000 class A and class B common shares of the former. The Monighan Co. will operate as a separate unit under the present management. At the annual meeting on March 4, however, four of the present seven directors will be replaced by representatives of Bucyrus-Erie. The sales organizations of the two companies will be combined.—*Chicago* (Ill.) *Tribune.*

Wire Screen Cloth Makers Form an Institute

THE WIRE SCREEN Cloth Manufacturers' Institute has been organized by some of the important companies in that industry. George E. Watson, formerly sales manager of the Wickwire Spencer Steel Co., Buffalo, has been appointed general secretary, with office at 74 Trinity Place, New York. The purposes of the institute are to operate a trade extension bureau to assist jobbers and dealers in selling wire screen cloth; to collect statistics; to study manufacturing methods, safety, transportation and merchandising problems; to promote standardization of product, and to develop a uniform method of cost accounting.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W. D. Callender, President; N. C. Rockwood, Vice-President; C. O. Nelson, Secretary

LONDON OFFICE: Dorland House, Mezzanine Floor, 14 Regent St., S.W. 1.

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